Green Growth, Degrowth, and the Commons

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Abstract

The concepts of 'Green Growth' and 'Degrowth' occupy central positions in the public debate on the relationship between economic growth and the environment. While proponents of the former approach claim that environmental measures can promote growth by e.g. more efficient use of natural resources, proponents of the latter maintain that environmental integrity can only be upheld by slowing down growth. This paper argues that both approaches constitute inadequate foundations for public policy as they fail to appropriately conceptualize social welfare. We show how policy aimed at social welfare can be understood as managing a portfolio of capital stocks some of which exhibit the characteristics of 'commons' (i.e. common pool resources and public goods). We then propose a program of 'welfare diagnostics', which aims at establishing minimum thresholds for capital stocks essential to welfare as a guide for real-world policy formulation and discuss the role of appropriation of natural resource rents for its practical implementation. We conclude by highlighting the central role of scientific policy advice in determining how different conceptions of welfare would be reflected in setting targets and choosing the means to achieve them.

1. INTRODUCTION

Since the onset of the industrial revolution, the world has experienced unprecedented growth of population and economic activity (Galor 2005). From the year 1820 to 2003, global population increased more than six-fold, from about 1 billion to more than 6.6 billion, while average per-capita income increased almost ten-fold from about USD 700 to roughly USD 6,500, resulting in a more than sixty-fold increase in total economic output (Maddison 2003). This development coincided with a so-called 'socio-ecological regime transition' in the countries that embarked on industrialization, i.e. a shift in the relationship between human societies and their natural environment (Krausman et al. 2007). In particular, with the ability to control energy flows being one of the most important aspects of socio-economic development (Cleveland et al. 1984), the availability of abundant stocks of fossil fuels with high energy density has been identified as a crucial factor for the Industrial Revolution (Smil 2000).

This process has resulted in a marked decline of exhaustible resource stocks and the overuse of sinks for the uptake of waste products, thus putting considerable pressure on natural ecosystems. This has led some authors to question whether economic growth might overwhelm the earth's 'carrying capacity' (Arrow et al. 1995), whether we 'are consuming too much' (Arrow et al. 2004), and what can be done to prevent overstepping 'planetary boundaries' (Rockström et al. 2009).

The recent public discussion on the relationship between economic growth and the environment has focused on two central themes: On the one hand, the concept of 'Green Growth' emphasizes that sound environmental quality can be achieved either at modest costs (OECD 2011), or that environmental measures could even promote economic growth by means of efficiency improvements and induced technological progress (UNEP 2011a). On the other hand, proponents of 'Degrowth' highlight the importance of slowing down economic growth as a prerequisite to safeguard environmental integrity (Jackson 2009; Victor 2008).

This article argues that both concepts – Green Growth as well as Degrowth – are eventually misleading, as they are both inherently based on the notion of economic growth. We propose a reframing of the debate in terms of social welfare, understood as the aspirations a given society aims to achieve. From this perspective, economic growth is not regarded as an objective *per se*, but rather as a means to achieve certain ends. As a consequence, economic growth is deemed to be desirable or undesirable to the extent that it facilitates, or complicates, respectively, the attainment of these ends. As will be discussed in this paper, approaches to derive an empirically observable welfare measure as a guide for public policies (as an alternative to economic output) face serious practical limitations. We then argue that management of a portfolio of 'commons' – understood as all stocks that jointly belong to or affect all of a given community (i.e. common pool resources and public goods) – is central for economic policy to raise welfare. In order to operationalize this approach, we propose a program of 'welfare diagnostics', which aims at establishing minimum thresholds for capital stocks essential to welfare and discuss the role of appropriation of natural resource rents for its practical implementation. Finally, we highlight the central role of scientific policy advice in determining how different conceptions of welfare would be reflected in setting targets and choosing the means to achieve them.

This paper proceeds as follows: Section 2 reviews the debate on natural limits to economic activity and critically discusses the concepts of Green Growth and Degrowth. It provides an overview of how

the question whether economic growth is feasible when the limited availability of exhaustible resources and carrying capacity of natural sinks are taken into account is addressed in the current debate. Section 3 provides a discussion of different conceptions of welfare and identifies their links to economic growth. In this section we discuss under which normative assumptions economic growth produces desirable or undesirable results, respectively. Section 4 discusses how management of a portfolio of commons constitutes a central aspect for economic policy-making and draws implications for public policy. Section 5 concludes.

2. RESPECTING NATURAL LIMITS

This Section provides an overview of how the question whether continued economic growth is feasible in the face of limited natural resources and sinks is addressed in the current debate. It introduces the concepts of Green Growth, which states that environmental integrity can be preserved at low or even negative costs, as well as Degrowth, which argues that the natural environment can only be preserved by curtailing economic growth. Finally, it provides a critical examination of both concepts.

2.1. Green Growth

Throughout the 1990s and 2000s, the debate on how to reconcile socio-economic development with natural limits has largely been dominated by the notion of 'sustainable development', most prominently captured in the Brundtland definition as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development 1987). The recent discourse, however, has increasingly shifted to the notion of Green Growth with reports by influential international organizations, such as the OECD (2011), UNEP (2011a), and the World Bank (2012a) dedicated to this issue. One possible hypothesis to explain this shift relates to policy-makers' unwillingness to sacrifice short-term economic gains for the sake of long-term sustainability, and that Green Growth has been adopted as a new narrative reconciling this apparent trade-off (Bowen and Fankhauser 2011, Jacobs 2013).

While there is no unanimously accepted definition of Green Growth, it should be noted that the term is used in two concurrent ways: The first one, which can be labeled 'strong' Green Growth (Jacobs 2013), claims that environmental policies would have positive effects on economic output even in the short term. This view is, for instance, supported by UNEP (2011a):

> "[G]reening the economy can generate consistent and positive outcomes for increased wealth, growth in economic output, decent employment and reduced poverty." (UNEP 2011a, p. 24).

The second, more standard, line of argument, stresses that sound environmental policies might be implemented at relatively modest costs, as they not only pay off for future generation, but also entail benefits for the present, as e.g. captured in the OECD's (2011) definition:

> "Green growth means fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies. To do this it must catalyse investment and innovation which will underpin sustained growth and give rise to new economic opportunities" (OECD 2011, p.91).

Both views have been subject to heavy criticism in the current literature. In particular, the optimistic assessment by UNEP (2011a) is primarily supported by scenario analysis based on a system-dynamics model called the 'Threshold 21 World model' (UNEP 2011b). In their Green Growth scenario G2, shown in Table 1~~Table 1~~, it is simply assumed that an (exogenously given) additional 2% of world GDP is invested in green measures over the period 2010–2050 without crowding out any investment in other sectors. That is, economic growth is driven by a higher rate of capital formation, and as pointed out by Schmalensee (2012), "it would be a surprise if such a dramatic increase in investment, even if some were allocated to unproductive uses, did not eventually produce an increase in GDP" (p.5). In addition, Victor and Jackson (2012) criticize UNEP's scenarios for (i) resulting in a reduction of CO_2 emissions of less than 17% below 2000 level by the year 2050, which is clearly out of line with the range of 50-85% recommended by the IPCC (2007) to achieve a 450 parts per million (ppm) stabilization target, and (ii) not taking into account distribution of income across regions, as the employed scenarios do not allow for higher growth in poorer countries (which display a higher carbon intensity of energy production).

	2011	2015		2020		2030		2050	
		BAU	G2	BAU	G2	BAU	G2	BAU	G2
Additional Investment (USD bn/year)	-	-	1,524	-	1,789	-	2,388	-	3,889
GDP per capita (USD/year)	9,992	10,737	10,874	11,698	12,156	13,512	14,926	17,068	22,193
Annual GDP per capita growth (%/year)	1.8%	1.8%	2.2%	1.7%	2.2%	1.3%	2.0%	1.4%	2.2%
Fossil fuel CO_2 emissions (Gt/year)	30.6	32.9	30.7	35.6	30.3	40.8	30.0	49.7	20.0

Table 1: Additional Investment, GDP per capita, annual GDP growth and CO_2 emissions in the UNEP BAU and G2 scenarios, respectively. Adapted from UNEP (2011b).

As a criticism of both perspectives on Green Growth, it has further been pointed out that – at least for the case of renewable energy – the alleged benefits to economic output, e.g. by lowered prices for fossil fuels and technology spill-overs, are hard to track down in practice (Borenstein 2012) and that if the costs of ensuring grid stability for high shares of renewable energy are appropriately taken into account their costs might be significantly higher than often assumed (Ueckerdt et al. 2013). In addition, some have argued that positive effects on employment, which are often emphasized in the discussion, might not be economically viable, i.e. that Green Jobs are "frequently a waste of taxpayer resources, a drain on the federal budget" (Furchtgott-Roth 2012, p. 50; see Bowen 2012 for a review

of the literature). Finally, Dercon (2012) conjectures that for developing countries, Green Growth measures may affect growth patterns in ways that entail distributional effects for the poorest members of society, concluding that "promises that green growth will offer a rapid route out of poverty are not very plausible" (p.17) and that "[the poor] should not be asked to pay the price for greening the planet" (p.17)".

In conclusion, the argument that environmental policies might promote economic growth and human well-being even in the short term seems to rest on weak empirical foundations. For this reason, it has been argued that environmental quality can only be safeguarded if economic growth is drastically reduced, as will be discussed in the next sub-section.

2.2. Degrowth

Historically economic growth has been related to increased pollution and use of natural resources. Therefore, restricting the extent of economic activity appears to be an obvious solution to alleviate pressures on the natural environment. A prominent example of this view is Herman Daly's (1991) notion of a 'steady-state economy'. Based on the work of Nicholas Georgescu-Roegen (1971) who highlighted that economic activity cannot be abstracted from its underlying physical processes, Daly (1991) outlines a vision of a sustainable economy as one in which the 'throughput' of energy and material does not exceed the planet's capacity to regenerate these resources.

A more recent perspective is provided by Jackson (2009). His argument rests on the observation that after crossing a certain threshold of about (year 2002) USD 15,000, increases in per-capita GDP have little effect on improving factors that can be deemed essential for human well-being, such as life expectancy, infant mortality, or education. For the case of climate change mitigation, it is concluded (based on the IPAT identity[1]; Ehrlich and Holdren 1971) that in order to achieve a reduction of 50-85% below year 2000 emissions in 2050 with population growth of 0.7% per year and per-capita income growth of 1.4%, the carbon intensity of GDP would have to decline by about 7% per year. Jackson judges this as infeasible as it would require a dramatic structural break with historical developments and concludes that a transition towards an economy that delivers 'prosperity without growth' is required.

Yet, this conclusion has been challenged by Hepburn and Bowen (2012), who point out that even if per-capita GDP were held constant at its current level, annual improvements in carbon intensity of 5.6% (=7% - 1.4%) would be needed. It is then far from clear whether a stagnant economy should be more likely to deliver the technological innovation required to achieve a carbon intensity reduction of 5.6%, or a growing one to achieve a reduction of 7%. And indeed, the IPAT identity directly reveals that reducing GDP can only have a limited effect on emissions. For instance, emission reductions of 80% could be achieved either by reducing carbon intensity by 80% in an economy with a stable (total) GDP (20%=1*20%), or by reducing carbon intensity by 90% in an economy that doubles its income (20%=2*10%). That is, in the above example, halving GDP would only decrease the required carbon intensity reduction by 10%, i.e. from 90% to 80%.

[1] The IPAT identity states that environmental impact (I) can be stated as the product of population (P), affluence (A; i.e. per capita income), and technology (T; e.g. carbon intensity of GDP), i.e. I=P*A*T

In our view, there are a number of additional points of critique that can be raised against Degrowth as a viable option to mitigate climate change. The first concerns the distribution of per-capita GDP across regions. If global income were to be stabilized at their current level, it is hard to conceive of a global distribution other than one in which everyone has an equal share; otherwise, poor countries would be denied the opportunity of converging with countries that had a head-start in terms of industrialization, a position that seems indefensible from an ethical as well as a political perspective. Such an outcome would correspond to a per capita GDP of about USD 10,000, well below the threshold above which diminishing returns to additional income set in. This level would allow developing nations in Sub-Saharan Africa to increase their per-capita income seven-fold, while Latin America and the Caribbean would approximately remain at their current level. For richer nations, however, an equal distribution of current per-capita income would require deep cuts, of roughly 80% for the US, and about 70% for the EU. It seems very likely that such cuts would not only affect 'conspicuous consumption' (Veblen [1899] 1994), but also essential services such as healthcare, education, and social security.

The second point of critique concerns economic efficiency. For instance, again based on the IPAT identity, consider a reduction of CO_2 emissions of 10% by decreasing average per-capita GDP by the same amount. At current values, this would result in a reduction of CO_2 emissions[2] of about 3.3 $GtCO_2$, and a reduction of global GDP of roughly USD 7,000 billion. This corresponds to about USD 2,100 per tonne of CO_2 avoided, an order of magnitude above the most expensive technological mitigation options considered in scenarios derived from bottom-up studies or integrated assessment modeling (IPCC 2011). Even if economic growth is not desirable per se, there is no obvious reason why emission reductions should be achieved by reducing income if less costly technological options are available, which would free funds to invest in desirable areas, e.g. the provision of public goods. This line of argument also provides a critical perspective on the work by Victor (2008), who develops scenarios for the Canadian economy in which GHG emissions are reduced by means of lower rates of economic growth, while at the same time decreasing unemployment, poverty levels, and government debt. Yet, he does not provide a justification why lower economic output should be desirable if the latter objectives can be reached without curtailing economic growth.

Finally, one could argue that Degrowth contributes towards minimizing technological risks arising from the use of certain contested technological options, such as use of biomass, nuclear power, or carbon capture and sequestration (CCS). All these technologies are regarded to carry considerable risks related to e.g. potential impacts on biodiversity and food prices (for biomass), or accidents (CCS and nuclear) and nuclear proliferation. Yet, as depicted in Figure 1~~Figure 1~~, recent scenarios of climate stabilization at 450ppm-CO_2 generated with the integrated climate-energy-economy model ReMIND-R (Leimbach et al. 2010)[3] point to the fact that reducing the rate of economic growth would not significantly change the optimal technology portfolio[4]: Compared with the scenario with a high rate of growth of on average 2.8% between the year 2010 and the year 2100 (Figure 1~~Figure 1~~a), the

[2] Excluding other greenhouse gases and CO_2 emissions from international transport. Data are for the year 2011 from EDGAR (2013).

[3] ReMIND-R combines a Ramsey-type optimal growth model with a technology-rich energy system model, incorporating a detailed description of energy carriers and conversion technologies that include a wide range of carbon free energy sources.

[4] Scenario data were obtained from the RoSE project (Kriegler et al. in preparation). The contribution of different technological options to mitigation of CO_2 emissions was calculated according to the method described in Luderer et al. (2012).

scenario featuring a lower growth rate of 1.7% over the same time horizon (Figure 1~~Figure 1~~b) features an almost identical use of nuclear power and biomass combined with CCS, despite considerably lower emissions in the business-as-usual trajectory. By contrast, in the low-growth scenario, the decreased requirement for abatement of CO_2 emissions results in reduced use of renewable energy (such as solar, wind, or geo-thermal). That is, a low-growth strategy does not allow the undeniable technological risks to be addressed in the most effective way. Instead of reducing economic growth, tackling these risks directly via well-tailored policy instruments would be the more efficient solution.

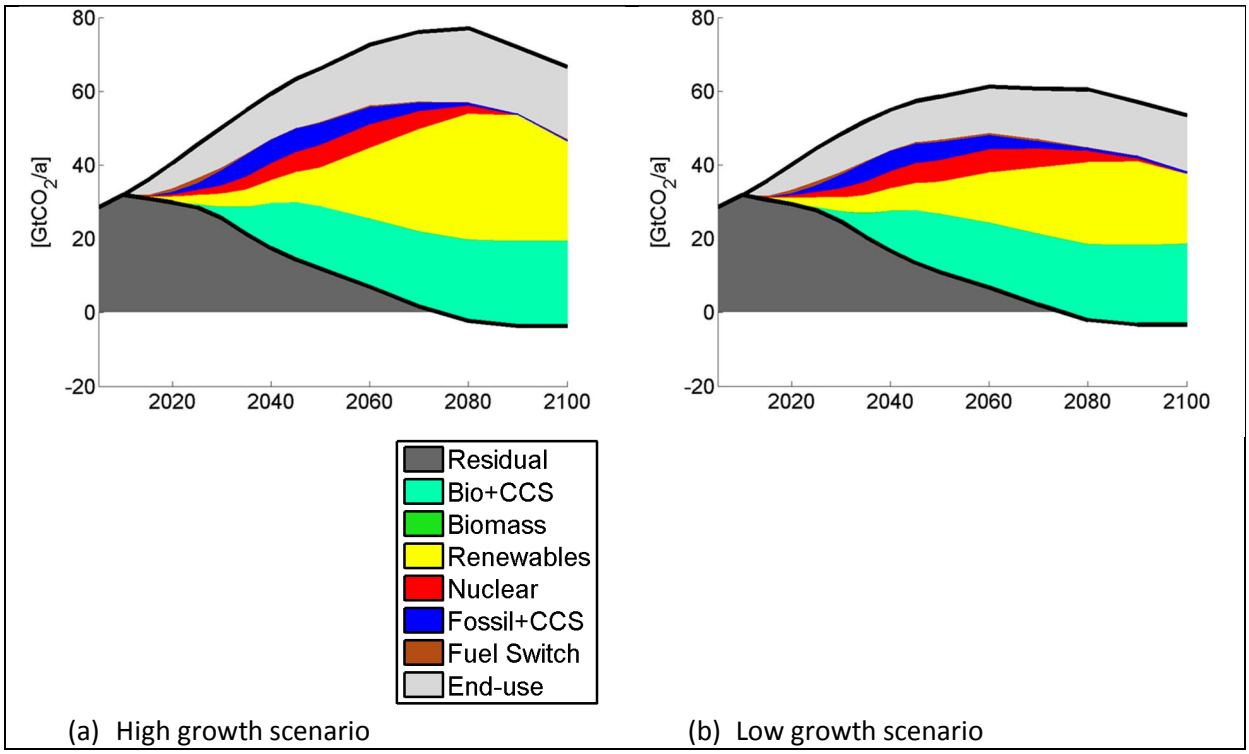

Figure 1: Technology Portfolios to achieve a 450ppm CO_2 target under scenarios assuming high (left) and low (right) rates of economic growth, respectively. The upmost line represents emission in the respective business-as-usual scenario, while emissions in the stabilization scenario are given by the lowest line. The contribution of individual mitigation options is depicted by the wedges between these two lines.

2.3. Evaluation of the Concepts of Green Growth and Degrowth

From the above discussion, we conclude that neither Green Growth nor Degrowth provide convincing narratives for how to achieve human well-being in the face of environmental scarcities. In our view, this is explained by the fact that neither perspective provides consistent answers to the following questions: First, what is the objective being pursued? Second, is this objective 'right' from a normative point of view? Third, is the objective attainable with the proposed means?

Green Growth as well as Degrowth both adopt economic growth as their central concept. However, it seems plausible that (positive or negative/zero) economic growth as such cannot be a goal in itself, but can only be assessed in terms of its consequences – e.g. with regard to consumption possibilities, environmental degradation, health, leisure, etc. (Skidelsky and Skidelsky 2012). Proponents of Green

Growth argue that economic growth is desirable as it allows for improvements in human well-being. For instance, empirical evidence suggests that on average, there is an almost one-to-one relationship between economic growth and the incomes of the poorest segment of a population (Dollar and Kray 2002). On the other hand, the proponents of Degrowth see economic growth as inherently undesirable due to its negative consequences for the natural environment and various social aspects. That is, both concepts carry some implicit objectives that are to be pursued. Yet, neither these objectives nor their relative weights are made explicit, such that the conditions under which economic growth may or may not contribute towards achieving societal goals remain unclear. By not paying sufficient attention to the underlying goals to be achieved by promoting or restricting economic growth, respectively, both concepts ultimately confuse means and ends, i.e. they present targeting economic growth as an ends rather than a means to achieve certain ends.

As a consequence, we propose that the discourse on economic growth and the environment should be firmly based on the concept of social welfare instead of economic growth. From this perspective, economic growth cannot be regarded as a goal as such, but neither does it provide a justification for measures that aim at restricting growth directly. Rather, economic growth then becomes desirable or undesirable only to the extent that it increases or decreases welfare, understood as the things that a given society values.[5]

3. WELFARE, ECONOMIC GROWTH, AND THE ENVIRONMENT

This section discusses under which normative assumptions on social welfare economic growth is regarded as desirable or undesirable, respectively. It first outlines how welfare is most commonly addressed in standard neo-classical economics and briefly sketches some recent lines of critique against this formulation. It then proceeds to an overview of some prominent conceptions of social welfare. Finally, it discusses attempts to derive an empirically observable welfare measure from economic theory in the form of 'net national product' (NNP), and criticizes its inadequacy for practical purposes.

3.1. Different Conceptions of Social Welfare and their Normative Implication for Economic Growth

The neo-classical economic theory of welfare is based on the notion of a social welfare function supposed to capture all conceivable varieties of social aspirations. Yet, the social welfare function employed most frequently is highly simplistic: it depicts a representative agent or household aiming to maximize a utility function (sometimes referred to as 'homo oeconomicus' paradigm; see e.g. Kirchgässner 2000) in which private consumption enters as the only argument. In such a setting, economic growth allows for higher levels of (current or future) consumption, i.e. it unambiguously increases the argument entering the social welfare function. Therefore, under these highly restrictive assumptions economic growth is synonymous with welfare gains.

[5] This is very much in line with what has been termed 'a-growth' by van den Bergh (2011) namely "agnosticism and by implication indifference about economic growth as commonly interpreted" (p. 890). The notion that economic growth can only be evaluated in terms of social welfare has been inter alia espoused in a recent treatment of India's development record, revealing that despite comparatively high growth rates, India significantly lags behind poorer countries in important dimensions of human development, such as life-expectancy, health, and education (Drèze and Sen 2013).

Yet, these assumptions have come under heavy attack from various schools of thought, summarized in Table 2~~Table 2~~. First, research in the field of behavioral economics has convincingly demonstrated that individuals cannot be assumed to act as rational utility maximizers; rather, they are subject to 'bounded rationality' (Simon 1955), and their decisions are frequently biased due to heuristics employed to derive approximate solutions for complex problems instead of carrying out a full optimization process (Kahneman and Tversky 1979, 1984; Frey 2008). Second, preferences are malleable and can be influenced by e.g. habituation, institutions, or framing – i.e. how different options are presented (Thaler and Sunstein 2009). Third, human beings do not exist in a vacuum but are a highly social species. For this reason, their decisions are influenced by the decisions of others. In this context, social norms and roles play critical roles for individual behavior (Akerlof and Cranton 2000), as people take e.g. their labor market decisions not only based on the outcome in terms of personal consumption, but also take into account in how far their choices correspond to the social role they assign to themselves and others assign to them. Likewise, empirical evidence suggests that individuals' satisfaction derived from consumption not only depends on their particular consumption level, but also on those of others (Frank 2005). Fourth, assuming that the whole population can be modeled as a representative household abstracts from distributional concerns. Thereby, effects on e.g. the poorest members of a society are not given a higher weight, as required by at least some ethical perspectives (Sen 1999). Fifth, normative obligations towards future generations, which are central for sustainable development, cannot be inferred by the observed behavior (i.e. the revealed preference) of current generations (Dasgupta 2004). Finally, the standard view of utility as the only determinant of welfare is inherently outcome-based, thus failing to take into account that the process by which a certain outcome is obtained may also influence its moral quality (Sen 1995).

Assumption	At odds with reality	Consequence for welfare concept
Maximization of utility	Bounded rationality	Need to distinguish what people choose and what they actually aim to achieve.
Constant utility function	Malleable preferences	Need to take into account habituation, framing, etc.
Individualized decisions	Role of social interactions	Need to take into account social context.
Representative household	Heterogeneity	Need to take into account distributional issues.
Future generations represented in utility function	Limited altruism and foresight with regard to future generations	Welfare function needs to be extended to include sustainability as an objective
Evaluation of consequences only	Considerations such as moral duties and fairness of procedure also matter.	Requires a more flexible, multi-dimensional approach to evaluate welfare.

Table 2: Common assumptions of neo-classical welfare theory, why they are at odds with reality, and associated consequences for the evaluation of welfare.

As has been pointed out in Section 2, whether economic growth is desirable from a societal perspective crucially depends on the underlying perspective on social welfare. Welfare theory draws from political philosophy in order to combine different actors' preferences into a social welfare function that can be used as a guide for institutional design or policy formulation. The following paragraphs provide examples of some popular welfare conceptions.

Traditional utilitarianism as proposed by Bentham refers to people's subjective well-being, i.e. their utility. Assuming that utility can be measured in cardinal units allowing for interpersonal welfare comparison, it is argued that social institutions should be set up in a way that maximizes an aggregate of individuals' utilities. This traditional point of view has recently been resurrected through happiness research, with new welfare theory intending to provide what make people happy by means of public policy (Fleurbaey 2009, Layard 2005). This 'hedonic utility' perspective (Kahneman et al. 1997) acknowledges that preferences are often inconsistent, ill-defined and influenced by the available infrastructure, advertisement or default options (Fleurbaey 2009, Loewenstein and Ubel 2008) and that people's choices often have no normative basis because they are not in line with their subjective well-being (as e.g. confirmed by self-control problems and the lack of time-consistent preferences). In the presence of status consumption and habituation economic growth does not necessarily increase happiness: first, if satisfaction is exclusively derived from being relatively richer than others, increases of incomes that do not change its distribution will not affect happiness (Frey 2008). Second, people overestimate the value of consumption for their happiness because only novel goods matter and they do not take into account that excitement about novelty will not last forever (Frederick and Loewenstein 1999, Layard 2005). Furthermore, if economic growth is achieved at the expense of other determinants of happiness, such as health, friendship, or family ties, it could even decrease happiness. Hence, from this perspective, economic growth is only desirable in as far it contributes to those aspects that promote happiness.

In contrast to approaches based on subjective well-being, the liberal interpretation of welfare theory assumes that whatever people choose makes them better off (Fleurbaey and Blanchet 2013, Creutzig and Mattauch 2013). This view of 'decision utility' refers to the economic calculus of understanding people's decisions by their revealed preferences, thus avoiding measuring well-being according to a cardinal measure (such as happiness). According to this conception of welfare, the goal of public policy is to enable people to get what they want. It emphasizes that people can have other legitimate goals than being happy, such as ensuring physical and moral integrity, the search for meaning and the desire to acquire specific capabilities. According to the liberal framework, there is no convincing method to justify public policy based on 'true' preferences of actors. From this perspective, institutions have to be designed for the purpose that people can satisfy their preferences (Frey 2008).[6]

However, this does not imply that liberal welfare theorists are not interested in economic growth. Liberal theorists like Amartya Sen have criticized the concept of hedonic welfare because of its insensitivity to poverty. As Sen (1999) argues, utilities can be very malleable in response to persistent deprivation. A person who is ill-fed, undernourished and unsheltered might increase their happiness level from small improvements even if the deprivation remains (ibid). As a consequence, he argues that public policy should focus on creating the capabilities to achieve certain 'functionings' (understood as states of doing or being) that can be regarded as central for human flourishing.[7] By putting opportunities at the center of the theory, this so-called 'capabilities approach' emphasizes the importance of ensuring the possibility of leading a dignified life, while at the same time

[6] However, even if one accepts the inherent danger of paternalism in the hedonic utility approach, it has to be acknowledged that the liberal viewpoint is silent on how institutions can be designed in a way that takes into account the interests of future generations and other potential human beings who cannot express their interests at elections or in the market place.

[7] Nussbaum (2011) provides a list of ten central capabilities that governments should make people able to pursue, including life, bodily health, emotions, and affiliation to others.

maintaining freedom of choice. Despite remarkable differences, other liberal theorists like Rawls (1971) and Dworkin (1977) who justify policy intervention based on an explicit theory of justice agree with Sen that resource endowment, capabilities or the well-being of the worst-off are relevant criteria for welfare assessments. In this perspective, economic growth is desirable if it increases the capabilities, the resource endowments or the well-being of the poorest people.

These considerations suggest that components other than subjective well-being – such as justice criteria – are important for social welfare. Hence, including these aspects explicitly in social welfare functions (see Fleurbaey 2009) could be a promising avenue towards a fuller conception of social welfare that acknowledges its multi-dimensional nature and the multiple objectives a society aims to achieve. In particular, it would contribute to the debate on Green Growth and Degrowth by requiring proponents of both views to elucidate on the factors entering into the social welfare function and their respective weights. Such an approach would also have implications for welfare accounting schemes and the development of guidelines for policy formulation if it yielded an empirically observable welfare measure to guide policy decisions. Attempts to construct such a measure will be discussed in the next sub-section.

3.2. Accounting for Social Welfare

Even though GDP – i.e. an economy's output of goods and services in a given year – has gained prominence as the most important single indicator guiding policy decisions, it does not constitute a good measure of social welfare.[8] Therefore, attempts have been made to develop alternatives to GDP as a measure of social welfare to guide policy decisions.[9] Such a measure would then capture all factors entering as arguments in the social welfare function weighed by their marginal contribution to welfare (i.e. their shadow prices). [10] As a consequence of this approach, government policies would result in an optimal level of welfare exactly if they maximize this welfare measure. One of the most prominent measures in this regard is 'net national product' (NNP). NNP has frequently been applied to analyze sustainability (understood as non-declining levels of welfare over time) thereby taking into account the inter-temporal dimension of social welfare (Weitzman 2003). In this sense, NNP can be understood as a corrected GDP that accounts for the accumulation or depletion of assets relevant for future consumption (and hence welfare). As prominently shown by Weitzman (1976), under specific assumptions – which will be discussed further below – NNP constitutes an appropriate measure of welfare (understood as an inter-temporal stream of discounted utility derived from consumption).

These theoretical advances have sparked a large body of empirical work. Hamilton and Clemens (1999) as well as Arrow et al. (2004) calculate 'genuine savings' that correct gross savings by (i)

[8] For instance, GDP does not include production that is not traded on markets, such as household production. On the other hand, defensive expenditures that are undertaken to undo harm caused by some economic activity (such as cleaning up environmental damages) enter positively, even if the same outcome could have been obtained at a lower level of GDP. It also does not take into account pollution damages and the depletion of natural resources, and it does not yield any information regarding the distribution of income in a society (Fleurbaey and Blanchet 2013).

[9] See Fleurbaey and Blanchet (2013) for an overview of welfare indicators.

[10] For instance, the 'measure of economic welfare' introduced to the literature by Nordhaus and Tobin (1972), corrects GDP for inter alia leisure, non-market work, disamenities of urbanization, and natural resource depletion.

depreciation of the capital stock, (ii) pollution damages, (iii) depletion of natural resources, and (iv) investment in human capital. That is, NNP is then given by the sum of consumption and genuine savings, with negative genuine savings indicating that a country is actually getting poorer by consuming its productive base.[11] These approaches have been more recently extended by the World Bank (2006, 2011) as well as Arrow et al. (2012) and UNU-IHDP and UNEP (2012) to give a more comprehensive overview of countries' wealth by establishing detailed accounts of stocks of physical, natural, and human capital. As pointed out by Hamilton and Hartwick (2014, this issue), non-decreasing levels of wealth over time indicate sustainable economic development.

Besides obvious practical problems related to measurement and data availability, the use of NNP as a welfare measure has been questioned on conceptional grounds. In order to calculate NNP, shadow prices (that express marginal changes in welfare in terms of the marginal utility of consumption) would be required. There is no reason to believe that market prices – which are used in the empirical exercises described above – equal or at least roughly approximate shadow prices as long as the economy is not on its optimal growth path (Fleurbaey 2009), which in practice seems highly unlikely.[12] Market prices very likely do not correctly signal scarcity, which is especially relevant in the presence of critical thresholds that once crossed might irreversibly imperil the functioning of vital ecosystems (Daly et al. 2007). For instance, despite rapid depletion of its natural capital, China displays substantial increases of national wealth mainly due to the accumulation of physical capital in all empirical studies cited above. Yet, NNP or genuine savings (calculated at market prices) cannot provide any guidance to the question of whether a growth model partly based on the transformation of natural into physical capital can be sustained in the long term. Even though empirical studies have assessed the elasticity between natural capital and physical capital (see Markandya and Pedroso-Galinato 2007), these analyses do not provide guidance for the long-term, i.e. whether there are limits to substitutability between these factors. Thus, instead of using NNP as an indicator based on available empirical data, governments would have to carry out direct simulations in order to assess the sustainability of their policies, in particular when natural capital cannot be substituted by physical capital.

From the above discussion, we conclude that efforts to use NNP as measure of welfare have provided important insights on the conceptual level. In particular, NNP highlights the need to account for all factors influencing social welfare instead of exclusively focusing on economic output, as is the case for GDP. Further, recent efforts to quantify stocks of natural resources, and physical as well as human capital have shown that the wealth of nations can be understood as a portfolio composed of different capital stocks. However, even though methods to estimate shadow prices have been improved in certain areas, they remains elusive for others. Due to the limitations discussed in the previous paragraph, we do not believe that NNP can be usefully employed in practice as a guide for policy-making. Therefore, the following section discusses an alternative approach building upon these insights.

[11] If one accepts the assertion that there are negative externalities to the depletion of natural such that market prices are below shadow prices (and there are no other positive externalities associated to the factors entering genuine savings), positive genuine savings is a *necessary*, but not a *sufficient* condition for sustainability, i.e. negative genuine savings indicate unsustainability, but positive ones not necessarily sustainability (Fleurbaey and Blanchet 2013).

[12] If it were on its optimal growth path, however, there would be no need for intervention by policy-makers, which casts at least some doubt on the usefulness of NNP as an empirically relevant measure.

4. THE WEALTH OF NATIONS AND THE WEALTH OF COMMONS

This section argues that a set (often called a 'dashboard' in the literature) of welfare indicators is required in order to take into account the multiple dimensions of social welfare and the related multiple objectives. It then proposes the basic contours of an approach to translate these indicators into guidance for policy formulation and draws implications for public policy.

4.1. Towards Welfare Diagnostics

As discussed in the preceding section, recent assessments have highlighted how a country's wealth can be conceived of as a portfolio of capital stocks, namely physical, natural, human capital, etc., that are of relevance for social welfare either because they are valued as such by society (e.g. education as a goal per se) or because they contribute to the attainment of societal aspirations (e.g. physical capital used to produce goods and services that raise material living standards). Achieving an optimal portfolio of these capital stocks is then a necessary (albeit not sufficient) condition for a social welfare maximum. Assuming that the central aim of public policy consists in maximizing social welfare – regardless of the particular welfare definition adopted – a crucial task for governments consists in identifying and correcting non-optimalities in a nation's capital stock portfolio. Those capital stocks that are not optimally provided by the market – i.e. that require active management – can be understood as commons. According to the Oxford Dictionary (2013), commons constitute "land or resources belonging to or affecting the whole of a community". For the purpose of this paper, we regard 'resources' as all capital stocks that affect social welfare. Consequently, our definition of commons encompasses common pool resources as well as public goods. For instance, natural resources that display common pool characteristics (which results in a 'tragedy of the commons'; Hardin 1968) are frequently over-used, resulting in a sub-optimally low stock of natural capital (Helm 2014, this issue). On the other hand, the observation that many people in poor countries lack access to electricity, sanitation, safe water, and telecommunications, as displayed in Figure 2, suggests that these public infrastructures are possibly under-supplied (see Estache and Fay 2007 for an overview). These capital stocks can also be understood as commons from a *normative* perspective, as it can be argued that everybody *should* have access to at least some basic goods and services. These rights to access can then be regarded as establishing a specific type of property right in the commons (Ostrom 1999).

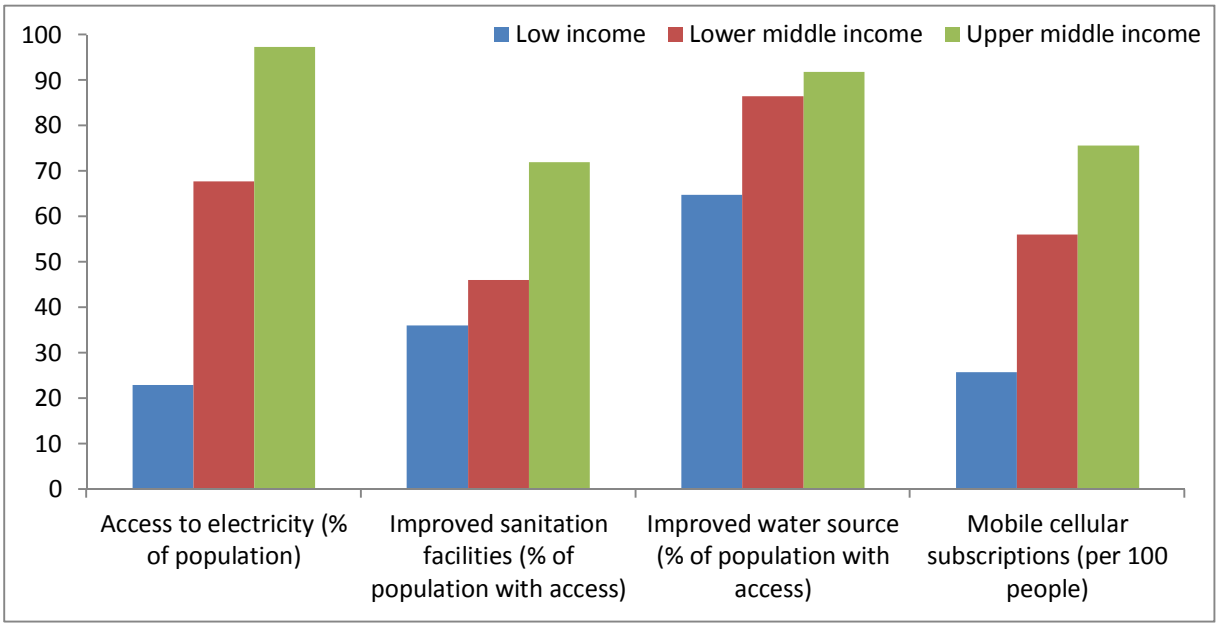

Figure 2: Access rates to electricity, sanitation, safe water, and mobile phones by income category (low-income, lower middle-income, and upper middle-income countries according to World Bank classification) for the year 2009. Source: WDI (2013). Note that high-income countries are not included, as they display practically universal access in all categories.

In theory, governments could then compute the socially optimal composition of the capital stock portfolio and implement policies to achieve it. In practice, however, this approach can be deemed to be infeasible, as it would require an explicit social welfare function on which these calculations could be based. As outlined above, a large variety of views on what constitutes social welfare exist[13], and it seems highly unlikely that all members of society agree to a single conception of social welfare.[14]

For this reason, we argue that an approach that is flexible enough to take into account different perspectives on social welfare as well as the multiple objectives (such as liberty, equality, happiness, etc.) related to them is needed. These multiple dimensions of social welfare cannot be reasonably aggregated (at least not without an arbitrary choice of weights for each individual component) into one composite indicator, such as NNP; rather, a dashboard of relevant indicators will be required. This was actually one of the central insights of the Commission on the Measurement of Economic Performance and Social Progress (Stiglitz et al. 2009). Recognizing that "[t]o define what well-being means a multidimensional definition has to be used" (p.14), the Commission lists eight key dimensions of well-being that should jointly be taken into account.[15] Yet, with its task being the

[13] For instance, Hulme (2009) convincingly demonstrate how different evaluations of the issue of climate change as well as possible solutions depend on social values, perspectives, belief systems and ideologies etc.
[14] Arrow's (1951) famous 'impossibility theorem' demonstrates that individual preferences can only be aggregated into a social welfare function under very specific conditions.
[15] These include: Material living standards, health, education, personal activities, political voice and governance, social connections and relationship, environment, and (economic as well as a physical) insecurity. (ibid., p.14-15).

elaboration of welfare metrics, the Commission stopped short of developing recommendations for how to make these criteria operational for public policy decisions.[16]

The approach to translate indicators that reflect the different dimensions of welfare into guidance for policy making mandated in this paper could be labeled 'welfare diagnostics', in analogy to Hausman et al.'s (2005) idea of 'growth diagnostics'. The central idea behind growth diagnostics is that in order to achieve real benefits in terms of fostering economic growth, one does not need to remove all distortions in an economy, which might well be impossible in practice. Rather, it is argued, a pragmatic approach consists in targeting the biggest market or government failures and focus on the most important constraints holding back economic development. Likewise, welfare diagnostics would aim at identifying factors that are essential for human well-being – i.e. basic needs – and correcting deficiencies in their supply. In this manner, policies to which at least a large set of individuals who may hold very different views with regard to social welfare would agree could be derived.[17] This would be very much in line with Sen's (2009) analysis of theories of justice: Sen argues that while it may not be possible to reconcile different views into one overarching grand idea of justice (termed 'transcendental institutionalism'), it is still possible to establish partial rankings of institutional settings and identify those that are judged to be inferior (i.e. dominated by other settings in the ranking) by all theories in order to get rid of the most severe injustices.

Focusing on the most deprived members of a society and aiming to identify the material conditions to realize the basic 'functionings' (i.e. states of doing and being, see Section 3.1), welfare diagnostics could be regarded as inspired by what Rawls (1971) has called 'primary goods', namely "things that every rational man is presumed to want" (p.62). Recognizing the multi-dimensional nature of human well-being, welfare diagnostics has much in common with the capabilities approach discussed above. In addition, like the capabilities approach, welfare diagnostics would crucially depend on public deliberation in order to make normative concepts transparent and spell out what factors are regarded as relevant (i.e. what goals people may pursue in their lives) and what can be understood as a 'basic need' or 'minimal requirement'.[18]

In practice, welfare diagnostics could be operationalized by establishing minimum thresholds, or 'guardrails' for capital stocks essential to welfare. These include stocks that directly influence welfare, as they determine access to e.g. material requirements, health, or education, and those that might matter more indirectly, such as maintaining a level of environmental quality necessary for society's life-support systems. Some recent proposals in this direction include the so-called 'Sustainable Development Goals' (Griggs et al. 2013) that extend the Millennium Development Goals (MDGs) by conditions necessary to assure the stability of Earth's systems and proposals aiming to add issues such as climate change, unemployment, inequality and global market instability to the MDGs (Fukuda-Parr 2012). In a similar vein, Stern (2012) has pointed out that climate policy should be understood as dealing with equitable access to sustainable development rather than formulas for

[16] Note that the approach of using a dashboard of indicators has been adopted by several international bodies, including the OECD, UNEP, and the World Bank (Green Growth Knowledge Platform 2013).

[17] For example, providing access to energy or water for the poor would arguably appeal to egalitarians, liberal-egalitarians, utilitarians and some social conservatives.

[18] Pogge (2002) highlights that systemic differences between 'resourcist' (e.g. Rawlsian) and 'capability-based' (à la Sen and Nussbaum) approaches have been overstated and that the main difference is that "[c]apability theories assert, while resourcist deny, that a public criterion for welfare should take account of the individual rates at which persons with diverse physical and mental constitutions can convert resources into valuable functionings" (p.1f.).

emission reductions. Public policy would then be required to ensure that a country's capital stock portfolio is composed in a way that allows attaining these minimum thresholds for sustainable development. Due to the broad variety of welfare concepts outlined above, it would arguably be more demanding to find agreement on how to allocate available resources once these minimum thresholds are satisfied. However, public policy then still can play an important role in promoting the public debate by outlining the space of feasible options and discussion trade-offs between different objectives.

4.2. The Role of Public Policy for Managing a Portfolio of Commons

For public policy, we identify three central tasks related to the management of commons: first, correcting non-optimal use of existing capital stocks, e.g. natural resources, which creates rents; second, the appropriation of rents in order to levy financial resources; third, investing in public goods in areas where they are under-provided. These tasks are depicted in a stylized way in Figure 3~~Figure 3~~. By correcting over-use of natural resources and under-investment in public infrastructure, public policy can be regarded as a way to achieve welfare improvements by re-balancing an inefficient portfolio. While institutional and social capital is clearly an important aspect for the well-being of a society (Hamilton and Liu 2014, this issue), we do not include it in our analysis for two main reasons: first, to date no satisfactory way to assess its value exists Second, unlike the case of use of natural resource and investment in physical capital, the metaphor of a capital stock that can be deliberately built up or consumed is less straightforward for social and institutional capital. Hence, identifying how social and institutional capital can be included in our analysis is a promising area for further research.

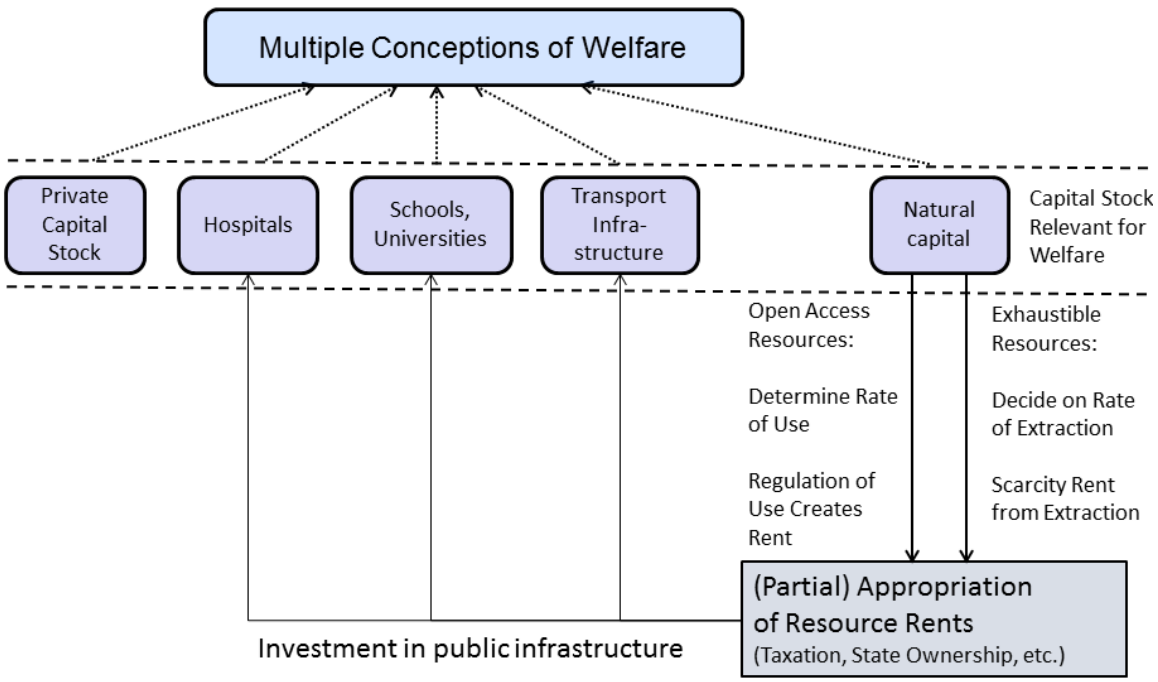

Figure 3: Stylized representation of generation, appropriation, and use of resource rents. Note that the capital stocks do not necessarily directly influence welfare, but are essential for welfare (such as e.g. health).

A classical result from natural resource economics is that common pool resources – i.e. resources that are owned by no one – are frequently subject to over-use, resulting in a 'tragedy of the commons' (Hardin 1968).[19] That is, exploitation will take place to the extent that their entire (Ricardian) scarcity rent – which would be preserved under optimal usage – is fully dissipated. Neo-classical economists have outlined a large array of policy instruments, such as taxes or tradable permits, to provide incentives schemes for the optimal use of scarce resources (Baumol and Oates 1975). Ostrom (1990, 2010) has broadened the scope of management options beyond the dichotomy of 'state versus market', demonstrating that under certain conditions local communities can succeed in creating institutional settings that prevent overuse of natural resources without the need for state intervention. Hence, policy makers would need to decide on the most preferable management scheme for common pool resources as well as on the extent of state intervention. From an efficiency perspective, improving the management of open-access resources will create rents accruing to society with the potential to raise social welfare. From an equity perspective, it can be argued that rents that are created by successfully solving a collective action problem should accrue to all members of society.

Rents created by improved management of common pool resources can be appropriated by the government in order to increase its financial resources.[20] This is most straightforward for the case in which taxes or auctioned permits are used. In addition, rents of fixed factors, such as land and sub-soil resources could be taxed without distortionary effects, as the rent would simply be transferred from the owners without influencing their incentives. The idea of taxing fixed factors goes back to Henry George ([1879] 2009). Regarding the distribution of land as inequitable and referring to it as belonging to everyone, George argued that a single tax on land could substitute for all other (distortionary) taxes on labor and capital and generate revenues to eradicate widespread poverty. Obviously, land is only one among a large spectrum of rent-yielding natural resources that includes e.g. fossil fuels and minerals. More recently, the approach of taxing natural resource rents has been taken up in the international context as a 'global resource dividend' by Pogge (2002b), who argues that appropriating just 1% of global resource revenues would generate enough funds to lift the poorest quintile of global population out of absolute poverty. In a similar vein, Segal (2010) suggests that if all countries were to redistribute their natural resource rents by means of unconditional cash transfers to their domestic population, the global number of people living on below $1-a-day would be cut by up to two-thirds, as depicted in Table 3~~Table 3~~. In the face of increasing budget deficits related to the global financial and economic crisis, the idea of using rents from natural resources as a means to generate government revenue in a non-distortionary manner[21] has gained considerable traction. For instance, an influential report on 'Australia's Future Tax System' (Henry et al. 2009) included an entire chapter on land and resource taxes. Acknowledging Australia's vast endowment of natural resources, the report states that a resource tax would "ensure that the Australian community receives an appropriate return on its non-renewable resources" (p.47) and recommends that a

[19] The argument, however, does not exclusively apply to natural resources but for all types of common pool resources.

[20] For instance, Bauer et al. (in preparation) estimate that for a climate stabilization target of 450ppm-CO_2-eq., the cumulative rent arising from carbon pricing over the period 2010-2100 would amount to a net present value of about USD 31 trillion (discounted at 5% per year).

[21] Of course, schemes other than a tax to appropriate these rents, such as state-ownership, are conceivable, too.

578 "uniform resource rent tax should be set at a rate of 40 per cent" (p.48).[22] More recently, it has been
579 demonstrated that such land taxes (more general taxes on fixed factors), in addition to their
580 revenue-raising aspect, can further increase inter-generational welfare if current generations under-
581 invest in capital accumulation (Edenhofer et al., 2013). That is, taxation of fixed factors not only
582 creates government revenue in a non-distortionary way, but would also create economic surplus by
583 correcting misallocations in the economy. Likewise, the IMF has recently emphasized the "relatively
584 low efficiency costs, benign impact on growth, and high score on fairness" of a tax on immovable
585 property (Norregaard 2013, p.1). However, it should be noted that rent taxation is unlikely to be a
586 panacea. As highlighted for the case of the double-dividend literature, which examines the public
587 finance implications of taxing externalities, such taxes can have adverse effects in the presence of
588 other (distortionary) taxes via so-called 'tax-interaction' effects (Goulder 2013), which requires an
589 assessment of their particular effects under realistic circumstances.

590

	Poverty, millions (%)	
	Current (Year 2008)	**With Resource Dividend**
World	1,327 (25.6%)	567 (10.9%)
East Asia and Pacific	307 (17.0%)	40 (2.2%)
EAP without China	113 (22.4%)	31 (6.1%)
Eastern Europe and Central Asia	20 (4.2%)	5 (1.1%)
Latin America and the Caribbean	46 (8.6%)	9 (1.7%)
Middle East and North Africa	10 (4.2%)	0 (0.1%)
South Asia	579 (40.3%)	286 (19.9%)
Sub-Saharan Africa	364 (52.9%)	226 (32.8%)

591 **Table 3: Global and regional poverty estimates: current and with resource dividend (year 2002-2006 rents). Adopted**
592 **from Segal (2010).**

593

594 Finally, the appropriated rents can be used to invest in capital stocks that are below the minimal
595 threshold discussed in the previous sub-section. In particular, public infrastructure delivering access
596 to services that are regarded as being fundamental for welfare, such as health, education, water,
597 sanitation, transport, telecommunication and energy, can be expected to be of high relevance in this
598 regard. Even though the details are contested, some studies suggest that investing in public
599 infrastructure would generate social returns exceeding those from private investment and hence pay
600 off from a purely economic perspective (Calderon and Serven 2014; Agénor and Moreno-Dodson
601 2006), especially if the required financial resources can be acquired by non-distortionary taxation of
602 fixed production factors, such as natural resources (Mattauch et al. 2013). Furthermore, there is
603 compelling evidence that in the presence of asymmetric information or externalities (e.g. in health or
604 education), direct provision of basic services can be considerably more efficient than their provision
605 through markets if governments are sufficiently accountable to their citizens (Drèze and Sen 2013). In
606 this context, it should be noted that the term 'public infrastructure' does not necessarily imply state
607 ownership. Rather, it indicates that the infrastructure in question has at least some public good

[22] Note that interest groups that would lose from the proposed resource tax have mobilized considerable opposition to this tax. This demonstrates the importance of political economy considerations for implementing such a tax and delineating ways to compensate losers.

608 characteristic, making them eligible under the above definition as a common. In this case, it will be
609 underprovided by the market, and welfare improvements can be achieved by either (i) direct public
610 provision, (ii) subsidies, or (iii) assignment of concessions or property rights with appropriate
611 regulation (e.g. a privately run electricity provider regulated by an authority preventing exercise of
612 market power). Which provision scheme is most preferable then crucially depends on a variety of
613 factors that need to be examined in each individual case, including the service in question, the
614 efficiency of public compared with private provision, ease of monitoring and regulation as well as
615 distributional effects (Birdsall and Nellis 2003). Setting up institutional structures that are responsive
616 to citizens' requirements, thus permitting them to find their own optimal stock, would arguably be
617 the most desirable option to guide public investment (Gramlich 1994). However, such an approach
618 seems hardly feasible for the provision of commons on a global scale, at least not in the near future.
619 Furthermore, in practice, governments may often have insufficient incentives to ensure that
620 infrastructure investments are efficient (Castells and Solé-Ollé 2005), and in countries with low
621 quality governance and limited political checks and balances, governments may use public
622 investment as a vehicle for rent-seeking (Keefer and Knack 2007). In such cases, it is conceivable that
623 financial arrangements bypassing the state – such as making resource rents available through
624 microfinance institutions[23] – might in the end yield better outcomes.

625

626 **5. CONCLUSIONS**

627 This paper has provided a critical evaluation of the current debate on economic growth and the
628 environment. We have argued that the popular concepts of Green Growth and Degrowth are
629 eventually misleading. As both concepts fail to make explicit which objectives are ultimately to be
630 achieved, it remains unclear whether these objectives are better served by promoting or curtailing
631 economic growth. That is, by focusing on economic growth instead of welfare both concepts
632 ultimately confuse means and ends, i.e. they present influencing the rate of economic growth as an
633 ends rather than a means to achieve certain ends. As a consequence, we have proposed that the
634 discourse on economic growth and the environment should be firmly based on the concept of social
635 welfare instead of economic growth.

636 Highlighting the difficulty of establishing an empirically observable welfare measure to guide policy
637 decisions, we have argued that an approach of 'welfare diagnostics' that takes into account the
638 broad spectrum of normative positions and the multi-dimensional nature social welfare could serve
639 as a basis for policy-making. In order to correct the most serious constraints to human wellbeing,
640 welfare diagnostics would aim at correcting over-use of natural capital as well as under-provision of
641 public goods (such as public infrastructure). As both natural capital and public infrastructure have
642 characteristics of commons, managing a portfolio of different capital stocks of commons can be
643 regarded as a central task of public policy, as exemplified by van der Ploegh (2014, this issue). In
644 particular, the possibility of appropriating natural resource rents to finance public investment creates
645 a close relationship between managing natural capital and investing in public infrastructure.
646 Successfully carrying out welfare diagnostics in practice would arguably to a large degree depend on
647 public deliberation, as it requires an assessment of what a society values, and in particular what can
648 be understood as 'basic needs' and 'minimal thresholds'. In this regard, participation of the scientific

[23] To our knowledge, this idea has not been addressed so far in the existing literature.

community in deliberative democracy plays a central role in outlining possible options and means-ends relationships. This 'pragmatic enlightened model' of scientific policy advice (Edenhofer and Kowarsch 2012) is inspired by the pragmatist philosophy of John Dewey, who argued that policy objectives have to be evaluated in the light of the practical consequences of their means. It "requires exploring alternative future pathways in order to identify the best means to an end and to compare alternative ends" (ibid. p.18), thereby communicating assumptions, value judgments and uncertainties in a transparent manner. In this way, scientists are seen as providing a map that not only outlines certain courses of action, but also highlights the involved trade-offs between individual policy objectives and describes how they would be evaluated from different normative positions. Such an option space can serve as a basis for public debate and a decision metric for policy makers. Identifying shortcomings of popular approaches and outlining potential ways forwards, this paper has aimed to make a contribution to the literature by providing the contours of a map that would help to base the debate on economic growth and the environment firmly on welfare-theoretic arguments.

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