Governing the Commons to Promote Global Justice - Climate Change Mitigation and Rent Taxation

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Abstract

Climate change mitigation means restricting the use of the atmosphere as a disposal space for greenhouse gas emissions, which would create a novel scarcity rent. Appropriating this rent via fiscal policies, such as taxes, together with already existing scarcity rents of land and natural resources, could be an economically efficient source of public revenues to advance human development objectives. This chapter discusses how an international climate agreement would turn the atmosphere into a common property regime and describes equity principles that determine how the resulting climate rent is distributed. We then estimate how carbon pricing in combination with appropriate revenue recycling could advance human development goals. We also consider equity aspects of distributing land and natural resource rents as well as the potential of these rents to promote global justice. Finally, we assess the political feasibility of combining rent taxation with targeted investment, drawing conclusions for the potential implementation of such an approach.

Keywords: Climate policy, land rents, natural resource rents, rent taxation, revenue recycling, sustainable development

1. The Challenge of Managing Global Commons

The atmosphere is a global common pool resource. It is de jure a 'res nullius' with open access as a disposal space for greenhouse gases (GHGs). Guaranteeing the sustainable and equitable use of the atmosphere requires the establishment of a global common property regime. Even though the voluntary national mitigation efforts agreed upon in the Paris Agreement are not legally binding, they have established a target to limit global temperature increase "well below 2°C" (UNFCCC 2015). The Paris Agreement might also enable nation states to cooperate and coordinate their national efforts towards a global common property regime for the atmosphere.

It is well understood that justice is central to climate change mitigation (Gardiner et al. 2010). People in developing countries will be most affected by climate change, whereas the largest share of GHGs in the atmosphere has been emitted in industrialized countries (Jakob and Steckel 2014). As the most severe climate impacts can be expected to occur in the far future, climate policy also entails important inter-generational equity dimensions (Markandya 2011).

Restricting the use of the atmosphere would create a novel scarcity rent, namely the 'climate rent'. Climate policy would reduce the rents accruing to the owners of coal, oil and gas – as demand for these fossil fuels declines, so would their value. Climate change mitigation policies hence bear important implications for global justice, not only in terms of avoiding impacts, but also concerning how the climate rent is distributed. Scarcity rents accrue for the atmosphere (for which scarcity is created as a result of an agreement to restrict its use), but also for land and natural resources, which face natural limitations. Although land and natural resources are usually governed on national or sub-national levels, just distribution of these rents will become an important issue.

This chapter argues that climate, resource and land rents could be used to promote sustainable socio-economic development, for instance by investing in education, health, or basic infrastructure. The Agenda 2030 to achieve the Sustainable Development Goals (SDGs) requires substantial additional funds, which will to a large extent need to be mobilized domestically (Franks et al. in prep.). We explore the potential of rent taxation for financing investments in SDGs. The trade-off between economic and social development and environmental integrity should be studied within this broader perspective. This would allow for a better understanding of how to design policies that provide an appropriate balance between short-term socio-economic and long-term environmental targets (Jakob and Edenhofer 2014).

This chapter proceeds as follows: Section 2 discusses how the climate rent is created, which ethical arguments have been brought forth regarding its distribution, and how it could contribute to financing

sustainable socio-economic development. Section 3 analyzes these issues for land rents as well as natural resource rents. Section 4 discusses the political economy rent taxation and implementation issues. Section 5 concludes.

2. The Climate Rent

Limiting the use of the atmosphere will create novel property rights. Carbon pricing can be welfare enhancing for two reasons (Edenhofer et al. 2015). First, it internalizes a global externality and can provide additional benefits, such as reducing local air pollution. Second, the associated public revenues can be used to lower distortionary taxes or to address underinvestment in public goods. To meet the SDG financing needs, public spending will need to be increased in most developing countries, which will require additional tax revenues. As due to institutional constraints (such as lack of administrative capacity and a large informal sector) possibilities to raise existing taxes remain severely restricted, taxing GHG emissions could be a promising source of additional public revenues. This section discusses what could be achieved by using fiscal instruments (e.g. taxes or tradable permit schemes) to put a price on using the atmosphere and using the associated public revenues to advance human well-being.

2.1. Implementation of Carbon Pricing on the International Level

Every ton of GHGs entering the atmosphere changes the global climate, irrespective of where it is emitted. The atmosphere therefore constitutes a global commons: on the one hand, the ability of the atmosphere to take up emissions is limited and overuse will lead to additional climate impacts. On the other hand, under current international law no country can be forced to stop using the atmosphere as a sink for its GHG emissions. International cooperation is required, in which countries are willing to voluntarily constrain their national emissions in mutual agreement with every other country. In 2015, nearly all countries agreed to cooperate under the Paris agreement to enforce international emission reductions. The new global climate governance architecture relies on three main pillars. First, countries established the global goal to keep temperature increase well below 2°C, with a view to limit warming further to 1.5°C. The 2°C target limits the disposal space of the atmosphere for CO_2 emissions to roughly 800 $GtCO_2$ by the end of the century (Edenhofer, Flachsland, and Kornek 2016). At the current rate (of about 40 Gt CO_2 per year), this 'carbon budget' will be used up in approximately two decades. Second, the agreement obliges all parties to submit an emission reduction target in their Nationally Determined Contribution (NDC). These voluntary pledges are not based on a shared distribution of the global carbon budget allowed for reaching the 2°C target. Instead, each country establishes its own climate policy ambition and the planned efforts of all NDCs are aggregated and compared to objectives.

Countries are then asked to increase their ambition level in a pledge-and-review system if the global emissions reduction level falls short of what is required to stay within the temperature targets. The third pillar constitutes a set of multilateral climate policy instruments used for distributing the burden among the members of the international community and for facilitating cooperation between countries.

International cooperation within the Paris agreement is impeded by the global commons nature of the atmosphere and associated free-riding incentives (Lessmann et al. 2015). Ambitious emission reductions of an individual country are only effective in achieving the global goal of limiting warming to well below 2°C if other states reciprocate the effort and globally aggregate emissions remain within the carbon budget. However, countries can reduce their own mitigation costs by lowering the ambition of their NDC, free-riding on the efforts of other countries. Concerns about national competitiveness and differences in the costs of emission reductions are further obstacles to ambitious global climate protection. Appropriate institutions and policy instruments are needed to counteract free-riding and increase ambition over time (Barrett 2005). Currently, the aggregate effort of intended NDCs is inconsistent with the ambitious targets of the Paris agreement (Edenhofer et al 2016). Complementary development of the pledge-and-review system is required.

There are several reasons why negotiations over internationally coordinated carbon prices are a promising way to enhance climate policy ambition (MacKay et al. 2015, Edenhofer et al. 2016). First, as will be argued in more detail below, carbon prices are an effective policy instrument to achieve emission reductions of NDCs at the least-cost. Second, carbon prices are easy to compare. A price on carbon is an approximate indicator of climate policy ambition and abatement costs of an individual country. While the same absolute emission reduction target can imply very different efforts – dependent on the reference level and stage of development of a country – a higher carbon price always leads to additional emission reductions. Negotiations over carbon prices therefore allow for conditional commitments to establish reciprocity between countries. An increase in the individual effort of a country through a higher national carbon price will only be realized if other countries do the same. In turn, if a country lowers their carbon price, other countries do the same, such that environmental quality on the whole is lowered as a punishment for the defector.

Negotiations about carbon prices need to respect the 'common but differentiated responsibilities' principle of the UNFCCC. Coordination on a common carbon price could start with a smaller set of countries that are at a stage of development allowing for the implementation of such a policy. The G20 could serve as an effective forum to start these negotiations. However, reaching the temperature goals cooperatively implies that other countries implement carbon prices at a comparable level in the future. In this case rich and poor countries must agree to a burden sharing mechanism. Using the US$100

billion of climate funding mobilized through the Paris Agreement, transfer payments could be made to poorer countries conditional on their minimum price for emissions (Cramton, Ockenfels, and Stoft 2015). The resources for example in the Green Climate Fund (GCF) would then link to the climate policy ambition of an individual country (Kornek and Edenhofer 2016). A country with a comparatively high carbon price would be compensated for its higher abatement costs, which creates an incentive for this country to pursue more ambitious climate policies in its NDC. This system has the potential to overcome free-riding incentives as it facilitates reciprocity between heterogeneous countries.

2.2. Carbon Pricing Revenues

Realizing the emission reductions inscribed in the NDCs will be pivotal to the success of the Paris agreement. While the agreement itself does not specify how each country should reduce emissions, many NDCs include carbon pricing as a climate policy instrument. A carbon price turns CO_2 emissions costly and implements the polluter pays principle. In particular, high-emission forms of production (e.g. energy from coal fired power plants) become more expensive and, if the price is sufficiently high, unprofitable over the long term. At the same time, renewable energies such as wind and solar power become more competitive. As carbon pricing reduces emissions irrespective of their origin, it is a promising policy instrument to achieve a country's NDC at lowest costs. A country can put a price on carbon by using an emissions trading scheme (for example in the European Union), a tax on emissions (as done in Sweden) or combining both instruments in a hybrid system (as in the Californian emissions trading scheme with a minimum price). Over the past years, more countries have begun to use carbon pricing and more schemes are scheduled for the coming years. Today, existing regional, national or sub-national carbon pricing schemes cover about 12% of global emissions (Kossoy et al. 2015). If China implements its envisaged economy-wide emission trading system, this share can be expected to rise to more than 20%.

One of the most crucial questions regarding carbon pricing concerns the appropriate price level. Two approaches are commonly used. First, the idea of internalizing an environmental externality requires estimating the 'social costs of carbon' (SCC), i.e. the economic damages arising from emitting one unit of GHG. Estimating SCC is notoriously contentious, not only due to substantial uncertainties regarding physical climate impacts, their economic valuation, and possibilities for adaptation, but also due to inherent normative characteristics of deciding how damages that occur to future generations should be appropriately accounted. A second approach is to determine carbon prices that would be required to achieve a certain stabilization target, such as 2°C, without passing a verdict on whether this target is socially optimal. The resulting prices crucially depend on numerous parameters, such as the stabilization target, specific model characteristics, the availability of key technologies and the

participation of key emitters in a global mitigation effort. For instance, a recent high-level commission has recommended carbon prices of between US$ 40 and US$ 80 for the year 2020 to ensure a reasonable chance to achieve the 2°C target (Carbon Pricing Leadership Coalition 2017).

Some object that the very aim of carbon pricing is to reduce emissions, i.e. to erode its own tax base, therefore making revenues from carbon pricing difficult to support as an important source for the public budget. This argument fails to take into account the inverse relationship between the carbon price and emissions, which can result in either increasing or decreasing revenues (which are determined by multiplying emissions with the carbon price) depending on how sensitively emissions react to a carbon price. This sensitivity is an empirical issue that is mainly determined by the inertia of the energy system. A comparison of seven integrated energy-climate-economy models (Blanford, Kriegler, and Tavoni 2014, 27; Kriegler et al. 2014) reveals that carbon pricing consistent with a 2°C climate target would in fact result in rising revenues (despite declining emissions) until the year 2040, as shown in Figure 1. Hence, in a setting with ambitious climate change mitigation polices, carbon pricing could be counted on as an important revenue source over the period of at least several decades.

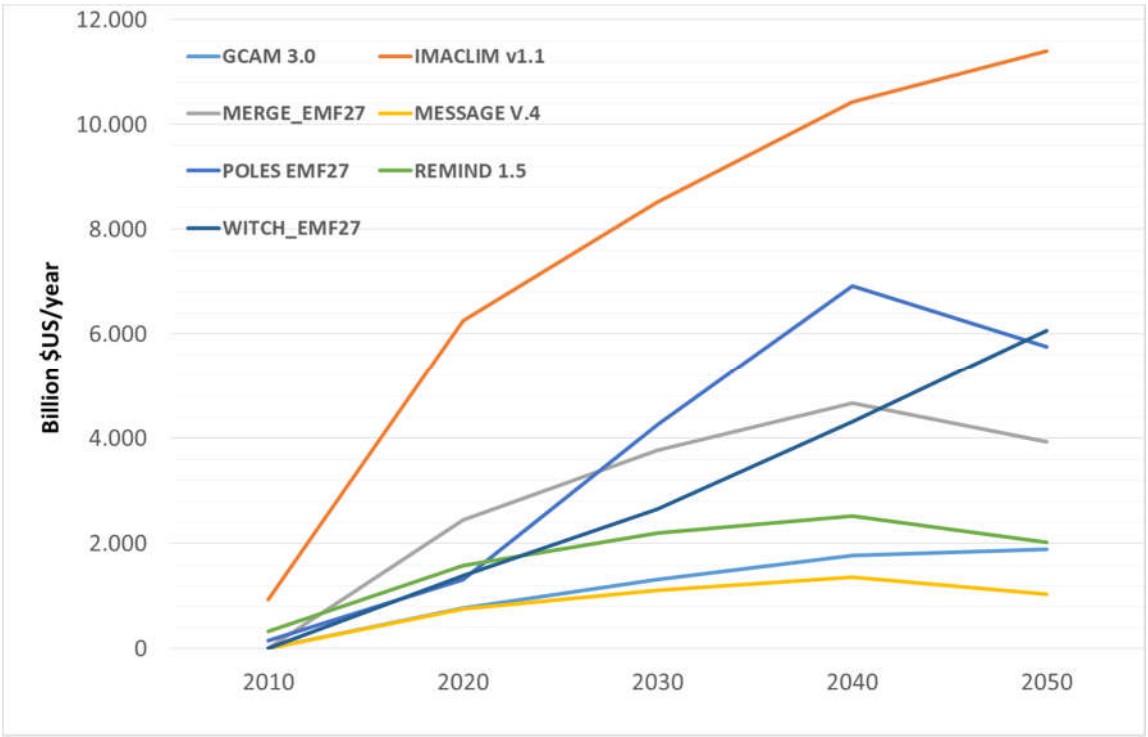

Figure 1: Revenues from carbon pricing under a 450ppm scenario with full technological availability. Data from IIASA (2014), based on scenarios from the EMF27 model comparison (Blanford, Kriegler, and Tavoni 2014; Kriegler et al. 2014).

2.3. Just Distribution and Revenue Recycling on the International Level

The creation of a new stream of revenues from carbon pricing and resource rent recycling raises questions concerning their just or fair distribution. Theories of Justice help inform what a just distribution of these revenues might look like. But one must ask not only how revenues ought to be distributed within states, but whether some states ought to redistribute a proportion of their revenues to poorer states. In contemporary global justice debates, there is deep disagreement about the extent of such redistributive claims. On the one hand, cosmopolitans argue that robust principles of distributive justice ought to apply globally, while minimalists argue that stronger principles apply within states. This division has been profoundly influenced by John Rawls' A Theory of Justice (Rawls 1971), and in particular his second principle of justice. This actually comprises two sub-principles, namely a 'fair equality of opportunity principle', and a 'difference principle' requiring any remaining inequalities among individuals to benefit the worst-off in society. Cosmopolitan interpreters argue that both principles ought to apply globally (Beitz 1975; Pogge 1989, 2002; Moellendorf 2002; Caney 2005). However, Rawls himself argued that these principles apply only within states, recognizing only weaker global principles (Rawls 1999). Depending upon one's conception of justice, one will recognize more or less stringent redistributive demands.

Many theories would also differentiate between normative claims to revenues drawn from presently un-owned resources, such as carbon emissions, and claims to revenues from land or natural resources, which are variously owned, taxed and traded already. Carbon rents are an illustrative case. Most accounts of climate justice conceive of the atmosphere as an un-owned common, and proceed in distributing rights to emit on the basis of basic equality of entitlement (Singer 2016; Vanderheiden 2008). Given the absence of plausible claims to the atmosphere, carbon rents might be subjected to various principles of redistribution, including equality, according to which all benefit equally; sufficiency, according to which benefits bring those in deprivation to a normatively adequate level of wellbeing; or priority, according to which benefits go to the very worst off. But because carbon pricing regimes envisage rents from terrestrial carbon sinks, for instance through the UN's REDD+ program, global redistributive claims might be resisted. This is not simply because the doctrine of permanent sovereignty over natural resources is recognized in international law, since this fact has no obvious normative significance for distributive justice (Armstrong 2015). Instead, claims to terrestrial carbon sinks may be differentiated from rents from carbon emissions on the basis of local entitlements or attachments to land and resources (Blomfield 2013). All the same, it is not clear that existing normative claims based upon improvement or attachment can support claims to benefit from carbon storage, which has only recently become a potentially valued resource (Armstrong 2017).

Although there is no universally accepted perspective of what constitutes an equitable sharing of the climate rent, the above considerations can guide an arrangement that would be widely accepted. A globally just distribution of the climate rent is closely tied to the promotion of well-being within individual countries, which we analyze in the next sub-section.

2.4. Using Carbon Pricing Revenues to Promote Human Development

The 'double dividend' literature has examined how fiscal policies to address environmental externalities, such as emission pricing, interact with the overall tax system. This literature has emphasized the efficiency gains that can be achieved by lowering other distortionary taxes (Goulder 2013). In contrast, relatively few studies have assessed the potential to use the revenues from emission pricing to increase public spending, which could advance social justice by improving the situation of the poorest members of society in line with the SDGs. This could be of particular importance for developing countries, which often face constrained fiscal space. From this perspective, the central objective of climate policy consists in advancing human needs and human well-being (Gough 2015; Lamb and Steinberger 2017).

Drawing on the median revenue projections of the 2°C scenarios shown in Figure 1, Jakob et al. (2016) calculate the extent to which carbon pricing revenues could finance access to basic infrastructure services. Their benchmark scenario assumes that no redistribution across countries takes place (i.e. the globally optimal carbon price is applied in each country, without side-payments or trade of emission payments). In this case, they find that for all regions except Sub-Saharan Africa (which at the same time displays the largest access gaps and lowest emissions, and hence the lowest revenues), carbon pricing revenues would be sufficient to finance universal access to water, sanitation, or electricity by 2030. In an alternative scenario, in which distribution of revenues is the average between the above scheme and an equal per-capita allocation of emission rights, Sub-Saharan Africa receives a substantially higher share of the global revenues, such that all countries would be able to achieve universal access to water, sanitation, or electricity. In a similar vein, Jakob et al. (2015) demonstrate that removing existing consumption subsidies for fossil fuels and redirecting the freed financial resources to infrastructure investment would allow about 70 countries to achieve universal water access, more than 60 countries would have universal access to sanitation, and more than 50 countries could provide access to electricity for their entire population by 2030. Finally, Franks et al. (in prep.) consider additional investments related to achieving the SDGs, such as transport, health, education and food security. Relying on the 2°C scenario from Figure 1 and assuming a complete phase-out of fossil fuel subsidies, they find that very few countries would be able to *fully* finance SDG investment needs from the additional revenues from such fiscal reforms. However, a substantial amount of

countries, especially in South- and Southeast Asia, could meet *more than half* of their financing needs from this novel source of public revenues.

3. Resource and Land Rents

Institutions such as international agreements create scarcity for the use of the atmosphere as a disposal space for GHGs. In contrast, land and natural resource rents arise from their natural scarcity. Even though some have argued in favor of a global governance regime for land (Creutzig 2017), ownership of land and natural resources is in most instances confined to national boundaries – another marked difference from the atmosphere. This section discusses to what extent land and resource rents can contribute to public finances and examines equity aspects relevant for their just distribution.

3.1. Taxing Land and Natural Resource Rents

Natural resource rents are determined by the difference between the price of a commodity and extraction costs. The World Bank (2011) estimated that in 2010, global natural resource rents amounted to more than 3 trillion US$, or slightly less than 5% of global GDP. These resources include forests, oil, gas, coal and minerals (bauxite, copper, lead, nickel, phosphate, tin, zinc, gold, silver and iron), of which fossil fuels account for the lion's share. Estimates for land rents show substantial variation, depending on what kinds of land (e.g. agricultural vs. urban) are included in the analysis and the valuation of land-based amenities that are usually not traded on markets. Based on household data from selected developing countries in which respondents were asked to assess the economic value of the land they own or occupy, Kalkuhl et al. (submitted) find land rents ranging from about 1% to roughly 7.5% of GDP.

Land rent taxation is a central issue in classical economics (George 1879). Modern economic theory has reaffirmed that taxing fixed factors, such as land and natural resources, could increase economic efficiency (Norregaard 2013). In contrast, most taxes that are currently applied (e.g. on labor or capital) induce economic distortions. They may do this by reducing the incentive to work or save (Feldstein 1999). By contrast, taxes on fixed factors are either neutral (i.e. non-distortionary) or could even increase economic efficiency by addressing under-investment in capital. Such an under-investment may occur as a result of an oversized propensity to use savings to acquire fixed assets, such as land or natural resources (Edenhofer, Mattauch, and Siegmeier 2015). Land rent taxation could also be beneficial for the conservation of forests and ecosystems by reducing the incentive to convert areas to agricultural land (Kalkuhl and Edenhofer 2017), and for the reduction of urban sprawl by encouraging higher density in urban areas (Banzhaf and Lavery 2010).

For the aforementioned reasons, land rent taxes are promising tools for domestic resource mobilization. Kalkuhl et al. (submitted) carry out micro-simulations to assess the possible effects of land rent taxation for a number of selected countries. They find that taxing half of these rents would increase public revenues on average by about 15%. However, since in many countries poor households hold a substantial share of their wealth in the form of land, such an approach would have regressive effects on income distribution. In other words, measured as a share of disposable income, land taxes would put a higher cost burden on poorer households (see Figure 2). This outcome can be avoided by introducing an allowance that is not subject to taxation. Such a provision would reduce public revenue by about one third, but might be preferable in terms of social justice and political feasibility.

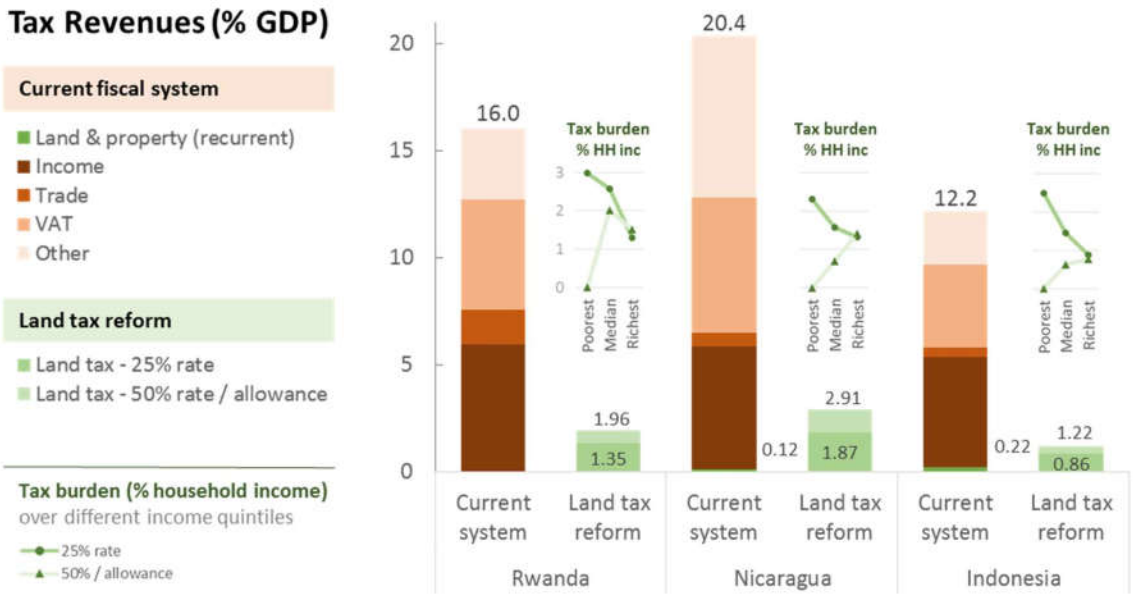

Figure 2: Current sources of tax revenues as well as potential of land taxes and distributional effects. Source: Kalkuhl et al. (2017)

3.2. Justice Arguments Concerning Natural Resource and Land Rents

There are long-running debates between cosmopolitans and their opponents about the just global distribution of resource revenues. Prominent positions thus have clear implications for how a new revenue stream might be justly distributed. Because some cosmopolitans believe that Rawls' difference principle ought to apply globally, any inequalities in the distribution of natural resources would be tolerated only if they benefitted the worst off (e.g. Beitz 1975). Pogge (2002) influentially argued that the global order fails in this regard, by systematically undermining human rights. For this reason, Pogge argues for basic resource entitlements for all to live minimally decent lives. Capabilities

theorists would similarly require greater redistribution of resource values if their under-provision systematically threatened the ability of some to live minimally decent lives (Nussbaum and Sen 1993; Sen 2009). More radical still are egalitarian and utilitarian theories. Armstrong's (2017) egalitarian theory holds that all important sources of advantage and disadvantage ought to be distributed according to a principle of equality of opportunity, while utilitarians require the allocation of resources to maximize global wellbeing or happiness (Singer 2016). Instead, non-cosmopolitan minimalists generally reject global redistribution, recognizing more robust obligations to fellow citizens or members of a nation. Risse (2012) accepts Rawls' restriction of the difference principle to individual societies, although he recognizes a minimal common ownership right to merely use natural resources in order to satisfy basic human needs. Miller (2007) and Moore (2001) both argue for the normative particularity of the nation as an ethical community or relationship, which involves justifying claims to resource values in order to be self-determining. Nonetheless, minimalists could hold that nations enjoy claims to revenues from natural resources, while granting that some proportion of these ought to be redistributed in the interests of extreme deprivation elsewhere (Moore 2012).

Global justice debates often focus upon resources such as oil or diamonds that appear little affected by human endeavor. Such resources are thus subject to either improvement or attachment-based special claims. Both improvement and attachment-based claims may be most plausible for land. This implies that any potential redistribution of land rents would be highly contentious. Although some follow Henry George in proposing land value taxation for efficiency reasons (Stiglitz 2016), it is an open question whether this could be supported by considerations of justice. One attempt is Steiner (1999), which argues for redistribution of all 'unearned' benefits, such as increases in land and natural resource values. However, this proposal is vulnerable to the objection that there is no way to disentangle natural from culturally produced values (Miller 2007, 59-60). Nonetheless, egalitarians might support redistribution of a proportion of land value once plausible improvement or attachment-based claims have been satisfied.

While theories differ concerning the robustness of global redistribution, and concerning the normative status of particular resources, redistributive claims may be strengthened by the shared global commitment to achieve the SDGs. Given the great inequalities that persist among nation-states, and the relative ease with which some can achieve these goals, redistribution of at least a proportion of resource revenues appears plausible according to most theories of justice, even if the strength of such claims can be expected to vary. In the case of climate rents, the case for redistribution is bolstered by evidence concerning the ability of rents to reduce severe deprivation, in line with the SDG agenda.

3.3. Using Land and Resource Rents to Promote Human Development

Segal (2010) highlights that purely domestic redistribution of resource rents on an equal per-capita basis could reduce the number of people living on less than US$1 a day globally by up to two-thirds. Resource rent taxation also constitutes a promising option to finance basic infrastructure, at least as part of the required investments to close these gaps. From this perspective of investment needs, Fuss et al. (2016) calculate that using rents accruing from natural resources on the domestic level (i.e. without any kind of redistributions across countries) would provide access to water, sanitation, electricity and telecommunications for the majority of countries. Figure 3 displays the share of resource rents that would be needed to close existing access gaps by 2030. In fact, many resource rich countries could meet their financing needs in each of these areas by using less than 10% of their resource rents.

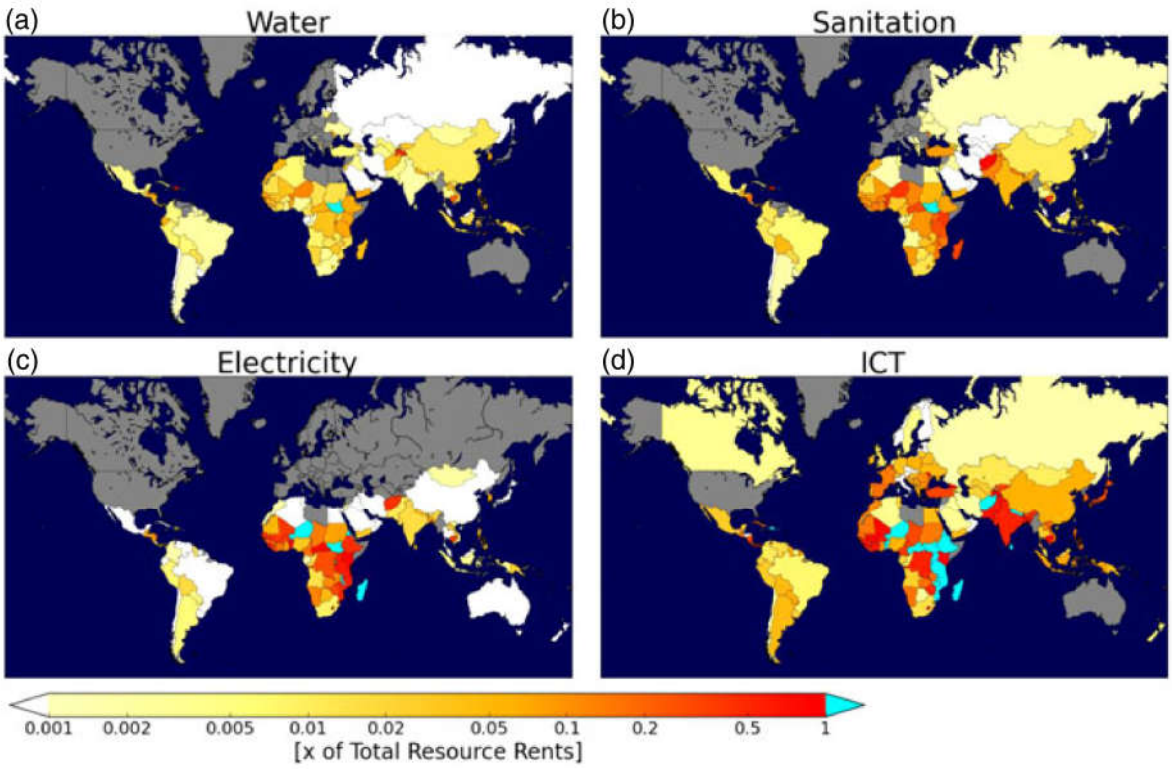

Figure 3: Total share of resource rents needed to simultaneously achieve universal access to (a) water, (b) sanitation, (c) electricity, and (d) telecommunication. Note logarithmic scale. Source: Fuss et al. (2016).

Some authors have claimed that natural resources rents accrue first and foremost because of market power rather than from resource scarcity (Hart and Spiro 2011). For instance, Hamilton (2009) argues that “scarcity rent made a negligible contribution to the price of oil". Without judging the validity of this argument, we would like to examine its implications for rent taxation. If it is true that rents to

resource owners can be characterized as monopoly rents, then the economically optimal solution mandates addressing this market power, e.g. by means of regulation. However, as markets for natural resources are global in scope, such an approach would require international cooperation. This might be difficult to achieve, especially for relatively poor countries possessing little influence on the formulation of global policies. As a consequence, a robust second-best policy may be to tax the profits accruing to firms that are extracting and dealing with natural resources. Such a policy applied in cases where underlying market distortion cannot be readily removed would transfer monopoly rents into public finance.

4. Political Feasibility and Implementation

Although internalizing externalities and taxing rents can be expected to raise social welfare, the political feasibility of such options depends on the use of the associated public revenues. This section addresses the question of how the attractiveness of such approaches can be increased for policy makers and examines issues associated with concrete implementation.

4.1. Political Feasibility

Carbon pricing can be expected to entail costs for individual households, e.g. in the form of rising electricity bills, costs of heating and transportation, as well as higher prices of goods and services that use energy as an input in production. In high-income countries, poorer households frequently spend a higher share of their income on energy-intensive goods and services. Carbon prices might then have a regressive effect, i.e. imposing a higher cost as a share of income on poorer households. Performing micro-simulations based on household survey data for roughly 80 countries, Dorband et al. (in prep.) demonstrate that for the majority of countries, carbon pricing would have a progressive impact on the distribution of income. That is, carbon pricing tends to be progressive for countries with per-capita GDP below US$ 8,000, but turns regressive at higher income levels. However, even in cases in which progressive results are obtained, carbon pricing could still entail sizable costs for the poorest segment of the population.

Several options have been proposed to avoid adverse impacts on the poor. In theory, revenues could in most cases be redistributed in a way that makes taxation progressive. In reality, however, discretionary spending is usually impossible and would be hampered by information and transaction costs. Hence, the chosen revenue recycling scheme is crucially important. Popular designs being discussed include per-capita recycling (e.g. in form of a so-called ‘tax-and-dividend’ scheme) and targeted reductions of taxes and levies that would favour low-income households (Klenert et al. 2017).

Recent carbon pricing schemes have, to at least some extent, adopted these approaches. For instance, British Columbia has designed its carbon tax in a revenue-neutral way, in which about 40% is reimbursed to households by income tax cuts as well as lump-sum transfers (Beck et al. 2015).

For developing countries, political feasibility may increase if the revenues resulting from a price on a commons are targeted toward investments that benefit low-income households. For instance, in Nigeria, Dorband et al. (2016) find that carbon pricing would impose the proportionally lowest costs on poor households. At the same time, these households are most affected by under-provision of basic infrastructure and would hence gain the most from increased provision. For this reason, combining carbon pricing with dedicated infrastructure spending would result in 'double progressivity'.

Another area in which revenues will need to be employed concerns the compensation of powerful lobby groups, which might otherwise resist the introduction of such a policy (Trebilcock 2014). A recent study based on integrated climate-energy-economy modelling (Bauer et al. 2013) estimates that limiting the atmospheric concentration of CO_2 in the atmosphere to a level that would be consistent with the 2°C target (450 parts per million (ppm)) would reduce the net present value of fossil fuels by about USD 12 trillion (see Figure 4). Even if this target were to be relaxed to 550ppm, which would correspond to a temperature increase of roughly 3°C, declining demand for fossil fuels would still reduce resource owners' rents by more than USD 8 trillion. Fossil fuel owners thereby have substantial incentives to oppose climate policies.

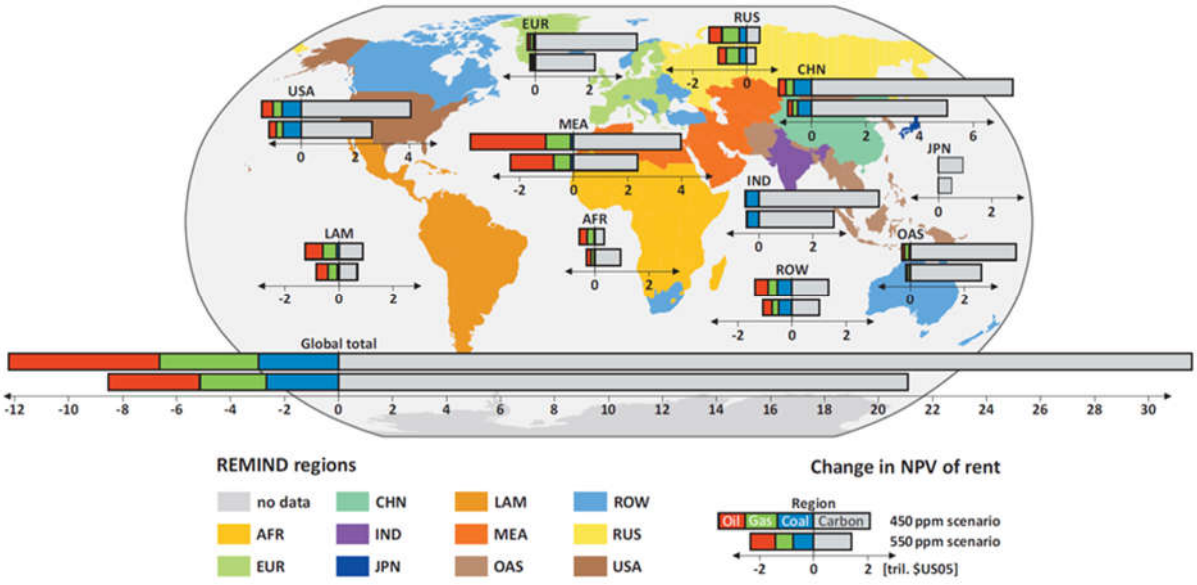

Figure 4: Projected changes in economic rents accruing to fossil energy carriers and carbon in mitigation scenarios, relative to baseline, over the 21st century (in US$ trn). The upper bar indicates the 450ppm scenario, the lower bar the 550ppm scenario. Both scenarios assume full availability of mitigation technologies and introduction of a global carbon price without delay.

Globally, declines of rents from oil (red), gas (green) and coal (blue) resulting from climate policy are overcompensated by the increasing carbon rent (grey). Data from Bauer et al.(2013).

On aggregate, however, such losses would be over-compensated by the rents that are created by climate measures. For the 450 ppm scenario, this would amount to more than USD 30 trillion, and for the 550 ppm scenario to more than USD 20 trillion. In regions such as Latin America and the Caribbean (LAM) as well as the Middle East and North Africa (MENA), losses are comparable or even higher than the value of the climate rent generated by carbon pricing. As such, these regions would likely require some kind of compensation in addition to the just sharing of mitigation costs, e.g. in terms of financial payments or technology transfer.

On the country level, the climate rent could be collected by inter alia a carbon tax or auctioning of emission permits. That rent could be used to increase the political acceptance of climate measures, for example by compensating fossil fuel owners for some of their losses. In emission trading schemes, energy-intensive firms and utilities have frequently been compensated by free allocation of emission permits, which has resulted in large windfall profits. Yet, awarding emission permits on the basis of past emissions (as e.g. under a 'grandfathering' scheme) creates a perverse incentive to 'ratchet up' emissions in order to obtain more free allocations in the future (Weitzman 1980). It needs to be ensured that these free allocations cannot be carried forward indefinitely - they must include sunset clauses. Even more importantly, capacity building (e.g. scenario studies also industry sectors) and R&D investments are required to prepare and enable future decarbonisation efforts.

4.2. Implementation

Putting a price on a common and using the revenues to promote social objectives can be regarded as a clear case of 'earmarking', which is a highly contentious issue. On the one hand it is seen to reduce flexibility and incentivize misspending. Others have argued that dedicating the revenues from an environmental tax to a specific issue that is seen to be socially desirable can greatly increase social support (Kallbekken, Kroll, and Cherry 2011).

Introducing carbon pricing can be expected to face important institutional and political barriers, such as the government's lacking ability to credibly commit to long-term policy (Nemet et al. 2017). For this reason, feasible policies need to be tailored to the specific economic, political and institutional context in which they operate. This might also explain why, in the real world, combinations of several policies are frequently observed. According to economic theory, the economically optimal solution consists in choosing one policy instrument for each market failure. It has been argued that for the case of climate

policy, technology policies are required to complement emission prices as they internalize positive externalities through learning-by-doing (Jaffe, Newell, and Stavins 2005). Yet, most countries display combinations of different policies that contradict this rule, such as emissions pricing combined with efficiency standards. These policy combinations can be understood from a second-best perspective to either alleviate distributional concerns if more efficient mechanisms (such as lump-sum payments) are not available to policy makers, or to increase credibility that the overall policy framework remains in place even if an individual instrument is revoked (Nemet et al. 2017).

Such 'second-best' considerations play an important role in dynamic settings, in which policies can be introduced in a sequence to build up 'winning coalitions' that can be expected to support more ambitious policies in the future. For instance, Meckling et al. (2015) argue that technology policies constitute an essential foundation for the introduction of carbon prices, as technological progress lowers the carbon price required to achieve a given emission target, and hence eases distributional struggles. For the case of Ecuador, Jakob (2017) provides examples of policies that could be politically feasible to implement and that might prepare the ground for a reform of fossil fuel subsidies. These include the reform of driving restrictions in urban areas, expansion of public transport and financial support for electric vehicles, which would make rising prices for transport fuels more acceptable by dampening their adverse impacts on household incomes.

5. Conclusions

We have argued that the atmosphere currently constitutes a common pool resource. Its sustainable management in the form of a global common property regime requires international cooperation and coordination among self-interested nation states. International cooperation could be strengthened by a combination of carbon pricing and conditional transfers. The revenues from carbon pricing and the taxation of land and resource rents could aid governments in their efforts to promote human development targets. We have used the SDG agenda to motivate an understanding of human well-being from a multi-dimensional perspective. Avoiding degradation of natural capital, the reduction of inequality and access to essential infrastructure services are at the core of this analysis. Using the revenues from taxing GHGs as well as land and resource rents to advance the SDG agenda could help to alleviate the trade-offs between economic efficiency and social justice.

Political feasibility is likely to be the most important obstacle for sustainable management of the commons and use of revenues in a way that promotes human development. Lack of credible commitments and powerful vested interests have the potential to undermine the trust in government, which is essential for citizens to accept taxation.

The approach to use rent taxation to further human development targets put forward in this chapter is less ambitious than many cosmopolitan or utilitarian theories of justice because the revenues under consideration are primarily within national boundaries. However, it is more ambitious than theories of minimalistic national justice because it argues for robust international support to enable poor countries to participate effectively in international agreements. While the approach proposed in this chapter is admittedly demanding, it might nonetheless be feasible and may even be preferable compared to more demanding proposals requiring sweeping global governance reform.

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