

INCORPORATING EQUITABLE CARBON ACCESS INTO CARBON TAXES

*Incorporando el acceso equitativo al carbono en los
impuestos al carbono*

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ABSTRACT

As climate change mitigation measures, carbon taxes ought to assign the burdens associated with decarbonization equitably and should at least aim to avoid perpetuating wide inequities in carbon access. While several popular carbon taxation schemes incorporate “feebate” or other redistribute adjustments designed to offset the regressive impacts of rising energy costs, seeking to neutralize the burden-sharing inequity of such policies, they can also contribute to inequities in carbon access, which constitute a second kind of inequity that offsetting schemes may not neutralize. Attention to resource-sharing principles that capture this latter equity objective suggests a comparison between downstream rationing schemes that allocate carbon access among persons and at the point of consumption, thereby instantiating resource-sharing equity, and the carbon pricing schemes that require extensive modifications in order to approximate such equity ideals. In this paper, I compare the two for purposes of focusing on this neglected second equity concern in the design of carbon pricing schemes like carbon taxes as well as on incorporating other justice-related advantages of downstream rationing into such a scheme.

Keywords: climate justice, carbon tax, personal carbon trading, climate change, mitigation

RESUMEN

Como medidas de mitigación del cambio climático, los impuestos al carbono deben asignar equitativamente las cargas asociadas con la descarbonización y, al menos, deben evitar perpetuar grandes desigualdades en el acceso al carbono. Si bien varios esquemas populares de impuestos al carbono incorporan ajustes redistributivos como “feebate” u otros diseñados para compensar los impactos regresivos del aumento de los costos de la energía, buscando neutralizar la inequidad en la distribución de la carga de tales políticas, también pueden contribuir a inequidades en el acceso al carbono, que constituyen un segundo tipo de inequidad que los esquemas de compensación pueden no neutralizar. La atención a los principios de reparto de recursos que capturan este último objetivo de equidad sugiere una comparación entre los esquemas de racionamiento aguas abajo que asignan el acceso al carbono entre las personas y en el punto de consumo, incorporando así la equidad en el reparto de recursos, y los esquemas de fijación de precios del carbono que requieren modificaciones extensas para aproximarse a tales ideales de equidad. En este artículo, comparo los dos con el propósito de enfocarme en esta segunda preocupación de equidad, a menudo descuidada, en el diseño de esquemas de fijación de precios del carbono, como los impuestos al carbono, así como en incorporar otras ventajas relacionadas con la justicia del racionamiento aguas abajo en dicho esquema.

Palabras clave: justicia climática, impuesto al carbono, comercio personal de carbono, cambio climático, mitigación



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I. INTRODUCTION

Carbon pricing mechanisms like taxes or rationing schemes rely upon price signals to incentivize efficient climate change mitigation efforts, but in the process also assign mitigation burdens and reallocate carbon access among sub-state actors (including persons) affected by carbon pricing. For reasons that parallel those applied to the burden-sharing and resource-sharing dimensions of climate change mitigation efforts at the international level, similar concerns for equity and differentiated responsibility can inform the design of such mechanisms at this second stage of domestic climate policy implementation. Climate justice imperatives continue to apply as national mitigation targets are implemented, with principles used to guide the allocation of mitigation burdens or carbon access resources between states are applicable to similar allocation issues within them. Whether states utilize a rationing scheme like an emissions trading system or a carbon tax as policy means to comply with their national mitigation targets, those mechanisms should also be just. But how do climate justice principles apply at this second (domestic) level?

In order to see how principles of equity and differentiated responsibility can apply to carbon pricing instruments we shall first note how they manifest in downstream rationing schemes, where carbon access is rationed among users at the point of consumption, then explore how the structure of that scheme can be approximated in a carbon tax. For reasons to be further explicated below, downstream carbon rationing schemes can be more equitable and better assign and mobilize responsibility for climate change mitigation in the assignment of remedial burdens and allocation of carbon access but are also more difficult to implement and operate. A carbon tax, by contrast, is relatively easy to implement and operate but as standardly configured fares poorly in realizing equity and responsibility principles, especially as these arise indirectly from increased prices. Considering the normative advantages of rationing schemes for purposes of designing a carbon tax to mimic several of those advantages allows for the construction of an approximately just carbon tax that also ameliorates several key objections against tax-based carbon pricing approaches and retains the tax's relative ease of implementation and operation.

II. MITIGATION EQUITY IN THE SECOND STAGE

In a second stage to the development of international climate change mitigation treaty architecture that specifies how each state party is to contribute to the wider effort, participating states must develop and implement policies to reduce their domestic emissions in accordance with national pledges and obligations. Like the first stage, which has been directed by the 1992 UN Framework Convention on Climate Change to assign those burdens "on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities" (phrases that have attracted considerable attention

from papers like this one), this second stage will involve some assignment of mitigation burdens, whether or not this internal implementation of national policies is conceived as a burden-sharing exercise or is guided by principles that are appropriate to one. It will also affect how carbon access is allocated, since its main effect is to reduce carbon access altogether and in doing so is likely to result in some substate parties losing access relative to others. Where the disadvantaged bear a greater burden from increased energy costs or where they are more likely to lose carbon access under a carbon pricing scheme, concerns for equity or justice arise.

From the perspective of the UNFCCC process, the manner in which states implement their carbon abatement targets is treated as a matter of state sovereignty rather than justice, so long as they comply with those national targets. The climate treaty is thus official agnostic about which (if any) normative principles ought to guide the implementation of national commitments, applying its well-known principles only to resource-sharing or burden-sharing between states rather than within them. As David Miller writes of this “two-stage” process, states in this second stage must decide how they will implement their national obligations “according to guidelines that are agreed internally,” not on the basis of justice principles identified for the first stage.¹ But this does not preclude the application of similar principles to the development or evaluation of internal policies, and indeed domestic mitigation efforts undertaken on behalf of compliance with national commitments should also reflect defensible assignments of remedial burdens when these assign mitigation costs or allocate resources, at least if such measures are also to be just.

Implementation of national mitigation commitments in this domestic stage is likely to involve industrial policies to transition away from fossil fuels in production, modernization of energy and transportation systems to do the same, along perhaps with a revision to social norms related to personal consumption and mobility. Sectors of the current economy may experience considerable growth while others may undergo planned contractions or be phased out entirely. Impacts on job opportunities will be significant, as will those on regional economies. Whereas “climate justice” typically names the set of normative concerns around the first stage of this process, where national mitigation targets are assigned within an international context, “just transition” typically names the set of similar but distinct objectives for the second stage, with the latter having received relatively little attention from philosophers or political theorists. As it has been characterized by the Climate Justice Alliance, just transition involves “a vision-led, unifying and place-based set of principles, processes, and practices that build economic and political power to shift from an extractive economy to a regenerative economy.”² If, as is claimed, “the transition itself must be

¹ David Miller (2009). “Global justice and climate change: How should responsibilities be distributed? Parts I and II.” *Tanner Lectures on Human Values* 28: 119–56.

² <https://climatejusticealliance.org/just-transition/>.

just and equitable” in its distributive effects, justice principles similar to those applied to the first stage must also be developed for the second, then applied to the design and evaluation of domestic mitigation policies and practices.

Central to this second stage of domestic decarbonization efforts in many countries is likely to be a carbon pricing mechanism through which price signals would incentivize many of the other aspects of the energy transition noted above. Whether relying upon a carbon tax or some kind of rationing system like an emissions-trading scheme (ETS)—the two most common climate policy instruments in practice and those most recommended by economists—the pricing of carbon would increase the costs of carbon-embedded goods and services, with downstream users bearing most of these mitigation costs. Absent some deliberate effort to assign such costs justly, they are likely to fall disproportionately upon the poor, in effect assigning remedial liability to those least able to pay and in many cases also to those least responsible for causing climate change. Although carbon pricing would in one sense reflect the polluter-pays principle in that its costs would be borne in rough proportion to each person’s carbon footprint, those costs would be highly regressive, disproportionately burdening the poor in their sources side impacts.³ For this reason, states implementing carbon pricing schemes have developed subsidies or offsets to blunt these impacts on the poor, assigning remedial liability in a more progressive manner as a result.⁴

Programs and proposals for addressing this regressive impact of carbon pricing abound. In the context of its upstream ETS, the Australian government provided cash transfers to low-income households rather than exempting them from the pricing scheme altogether in order to address equity concerns while maintaining the program’s efficacy. Similar transfers or subsidies have also been used to promote equity in other ETS schemes, including those in the EU and China.⁵ Other ETS schemes return a fraction of proceeds from the auction of permits to all consumers on an equal basis, as with California’s “cap and dividend” model.⁶ Likewise with carbon taxes, which have incorporated various progressivity mechanisms to offset the regressive impacts of a carbon tax, including proposals for luxury carbon taxes⁷ and allowances, offsets, or

³ Metcalf distinguishes between “sources side impacts” that are typically regressive across all income groups with energy taxes and “uses side impacts” (i.e. how such taxes affect wages, transfers and capital income), which can be progressive in carbon pricing schemes like a carbon tax. Whether or not the net impact of a carbon tax is regressive across all income groups remains contested, with offsetting schemes like the ones discussed here aiming to redress the former. See Metcalf, Gilbert E. (2022). “Five myths about carbon pricing.” MIT Center for Energy and Environmental Policy Research. <http://www.jstor.org/stable/resrep45424>.

⁴ Budolfson, M., F. Dennig, F. Errickson, et al. (2021). “Protecting the poor with a carbon tax and equal per capita dividend.” *Nature Climate Change* 11, 1025–1026.

⁵ See, for example European Commission (2015), EU ETS Handbook, online at https://ec.europa.eu/clima/sites/clima/files/docs/ets_handbook_en.pdf

⁶ Kunkel, Catherine M. and Daniel M. Kammen (2011). “Design and implementation of carbon cap and dividend policies.” *Energy Policy* 39(1): 477-486.

⁷ Benoit, Philippe (2020). “A luxury carbon tax to address climate change and inequality: Not all carbon is created equal.” *Ethics & International Affairs*, March.

dividends for low income groups.⁸ At the U.S. federal level, Citizens' Climate Lobby promotes a "Carbon Fee and Dividend" model that parallels "cap and dividend" schemes by offsetting carbon pricing for all consumers rather than only those in low-income groups.⁹ This interest in cost-neutrality may owe as much to concerns for political feasibility as those for social equity or justice, but such schemes seek to assign mitigation burdens progressively nonetheless.

Such programs or proposals acknowledge the potential for equity concerns to arise in the burden-sharing exercise of domestic mitigation efforts, or at least from the carbon pricing instrument that is viewed as central to such mitigation programs, and in different ways and to varying degrees of success seek to offset its regressive impacts. But few appear to have been designed with equity principles in mind and most do little to advance justice objectives such as those associated with just transition movements. With the notable exception of Chancel and Piketty's proposal¹⁰ for an additional tax to fund global adaptation programs rather than merely subsidizing domestic mitigation efforts, these proposals narrowly aim to offset the direct costs to (some) consumers of carbon pricing rather than seeking to utilize such mechanisms to fund the kinds of activities associated with "just transition" efforts or ambitious green jobs programs like the Green New Deal. So long as they efficiently reduce carbon emissions and have no negative net impact on the disadvantaged, they are assumed to be immune from the kind of expectations that have been applied to burden-sharing arrangements at the international level, where climate change mitigation has been cast as fundamentally concerned with equity and justice.

This focus on equity issues in the direct social costs of carbon pricing may obscure the equity issues that arise indirectly from it, including sectoral or regional job losses and other economic impacts from shifts away from fossil fuel extraction and combustions, and the use of revenues from pricing schemes to offset regressive direct (or sources side) impacts can crowd out efforts to avoid regressive indirect impacts such as just transition programs. A "feebate" system on carbon might, for example, return to most or all consumers a dividend equal to or greater than the economic cost to them of increased energy prices, and so avoid imposing a regressive tax through rebates issued to consumers, but do little to assist those persons and communities that depend on coal mining to transition toward an equitable low-carbon future. Its net effect could thus be to widen inequalities or exacerbate some disadvantage. In focusing only on the direct costs of carbon pricing, it attends to potential short-term impacts for poor residents of coal-dependent communities by preventing their utility bills from increasing but ignores longer-term and indirect costs to those communities of upending that industry and displacing its workers.

⁸ Boyce, James K. (2018). "Carbon pricing: Effectiveness and equity." *Ecological Economics* 150: 52-61.

⁹ <https://citizensclimatelobby.org/carbon-fee-and-dividend/>.

¹⁰ Chancel, Lucas and Thomas Piketty (2015). Carbon and inequality: From Kyoto to Paris Trends in the global inequality of carbon emissions (1998-2013) & prospects for an equitable adaptation fund World Inequality Lab, online at <https://halshs.archives-ouvertes.fr/halshs-02655266/document>.

Similarly, a “feebate” or carbon dividend is typically indexed to household income or revenues received through the tax rather than the recipient’s carbon usage, so while it may offset the average recipient’s additional costs it could still be a net burden for some high-emitting but poor recipients. For example, those low-wage workers commuting by automobile to more the affluent areas in which decent jobs are located may still be burdened by the higher cost of gasoline, which could in turn function to limit their access to labor markets—an effect that Austria’s carbon tax aimed to offset by differentiating urban from rural drivers.¹¹ By increasing the cost of automobility, indirect impacts such as these may generate equity issues that are not fully addressed by the otherwise-progressive nature of the tax and rebate scheme, manifesting as resource-sharing inequities in carbon access rather than burden-sharing inequities of direct mitigation costs. Attention to these indirect sources of regressive impacts of carbon pricing may allow for a more complete picture of the various ways that such policy instruments affect the disadvantaged and thus may better inform the design of domestic abatement programs that reduce emissions while also assisting in the economic transition for those who are now economically dependent on the fossil fuel economy.

III. FROM BURDEN-SHARING TO RESOURCE-SHARING: EQUITY IN CARBON ACCESS

Not all climate justice analyses of normative principles like equity and responsibility in the first-stage international treaty framework conceive of justice as requiring a burden-sharing exercise of the kind assumed above. Indeed, many (including my own view) treat justice in international mitigation as a resource-sharing problem instead, arguing for greater equity in per capita carbon access among nation-states than is exhibited in current use patterns rather than starting from the premise that climate justice requires some kind of equity in how mitigation burdens are assigned. A similar heuristic shift might illuminate shortcomings in how equity norms are incorporated into the second-stage problem of implementing national mitigation through domestic decarbonization policies (including carbon pricing instruments).

Rather than asking how implementation of national mitigation targets might impose differential costs across subgroups, a resource-sharing approach would ask how such efforts might lead to differentiated carbon access (and with it, how it affects the kind of opportunities that such access currently allows). Whereas nationally differentiated carbon access has been viewed as a potential obstacle to development, with advocates for developing countries claiming rights to equitable per capita carbon access rather than equity in per capita mitigation burdens, little attention has been paid to resource-sharing climate justice at the

¹¹ Eisner, A., V. Kulmer and D. Kortschak (2021). “Distributional effects of carbon pricing when considering household heterogeneity: An EASI application for Austria.” *Energy Policy* 156, 112478,

domestic level. Carbon pricing works by restricting carbon access to those unwilling (often because unable) to pay for it, and potentially with consequences for the disadvantaged when the elasticity of carbon is tied to socioeconomic inequality or other forms of disadvantage.¹² Individual or group-differentiated carbon access could result in obstacles to mobility, which in turn could affect access to labor markets and thus economic opportunity as well as to social, cultural, or leisure opportunities. Insofar as welfare opportunities remain partially coupled to carbon access at the individual level, as development opportunities are linked to it at the collective level, any policy instrument that widens inequality in carbon access should be viewed with some additional scrutiny.

Carbon pricing instruments that raise the cost of carbon-embedded goods and services, including any form of carbon tax as well as an upstream ETS that caps emissions at the firm or plant level would accomplish its short-term behavioral change objectives by pricing out those with more elastic demand for such goods and services. The affluent would likely continue to maintain their high-carbon consumption patterns in the face of such a tax (even if dramatically claiming that it would end such activities, as if this was bad for anyone but themselves), but the poor would likely be priced out of carbon access in the short run. Even with dividend-based “feebate” proposals that return some fraction of the proceeds of carbon pricing instruments to everyone equally or to those in low-income groups only, the increased price would serve as a *de facto* carbon rationing system to those on the low end of the socioeconomic spectrum. While the rebate might partially or fully offset the burden of increased energy prices for the poor, the rising price of carbon-embedded goods and services is likely to further widen existing inequalities in carbon access, with a disproportionate and deleterious impact on the poor.

This effect of widening inequity in carbon access may only be temporary. While carbon pricing works in the short term through this kind of elastic demand for carbon-embedded goods and services, potentially limiting welfare opportunities for the poor along with their carbon access, it works in the long run by shifting production and investment away from fossil fuels and into low- or zero-carbon energy sources. This imperative of maintaining greater equity in carbon access may therefore diminish over time as zero carbon energy sources become more widely available. Its regressive indirect impact in the short term may therefore give way to more neutral impacts over time, especially as effective climate change mitigation also reduces the impacts of climate change on the poor, but is worth acknowledging and responding to nonetheless.

It is for such reasons that Tim Hayward rejects the proposal to cast carbon emissions rights (which make claims for equity in carbon access) as human rights.

¹² Impacts of price increases on carbon access across income groups remains contested in the economic literature and depends in part on revenue recycling effects. For an overview, see Shang, Baoping (2023), “The poverty and distributional impacts of carbon pricing: Channels and policy implications.” *Review of Environmental Economics and Policy* 17(1): 64-85.

Such a view advocates for a basic emissions allowance as a surrogate for energy access or the wider set of consumption opportunities noted above but does so by claiming a right to carbon pollution rather than energy itself. As Hayward notes, “what the worst off have a right to is secure access to the means to a decent life,” and carbon emissions at some point will be neither necessary nor sufficient for this. While carbon access may be temporarily and instrumentally valuable so long as the world continues to rely on carbon-based energy, that reliance is the problem, making emissions a poor candidate for protection by some universal and presumably enduring human right.¹³ This is especially so insofar as emissions rights specify a floor rather than a ceiling for carbon access and since “emissions rights stand opposed to the most directly relevant of human rights in this context—namely, the right of each individual to an environment adequate for their health and wellbeing.” Hence, Hayward argues, carbon access ought not to be entrenched into rights as if inherently rather than contingently linked to justice.¹⁴

Hayward’s objection to guaranteeing carbon access as a human right lies not in the current importance of such access for human welfare opportunities, which makes carbon emissions now comparable to other resources or instrumental goods that are protected by human rights, but in (what we hope will be) its declining importance for and eventual decoupling from such opportunities. Recognizing the importance of ecological goods and services to human welfare in arguing for a human right to a quantum of ecological space (which is another resource that is instrumentally rather than intrinsically valuable), Hayward’s concern lies with the temporality rather than the instrumentality of carbon access. So long as we remain “locked into a carbon-dependent economic system,” we may nonetheless treat carbon access as among the resources currently relevant to justice and view increasing inequality in such access as a result of carbon pricing systems as a justice concern. We just shouldn’t entrench entitlements to such access as among enumerated human rights if we hope to transition to a world in which its importance to human welfare diminishes and eventually disappears completely. During such time that carbon access remains coupled with energy access, however, it remains central to justice, with resource-sharing principles articulating how such access ought to be allocated.

Among carbon pricing policy tools, rationing schemes are better able to allocate carbon access than are carbon taxes, with downstream rationing systems that allocate such access to persons and groups at the point of consumption better able to follow resource-sharing principles than are upstream rationing systems that do so at the point of production. While such schemes can be more difficult to implement than either upstream rationing or carbon taxes, they require fewer redistributive transfers in order to avoid the regressive impacts noted above.

¹³ Hayward, Tim (2007). “Human rights versus emissions rights: Climate justice and the equitable distribution of ecological space.” *Ethics & International Affairs* 21(4): 431-50, p. 446.

¹⁴ Hayward (2007), p. 440.

Indeed, these redistributive transfers that are often attached to carbon taxes or upstream rationing schemes can be viewed as modifications designed to make either of these two more popular carbon pricing schemes mimic the distributive effects of a downstream rationing scheme, which instantiates resource-sharing justice principles in its design and yields burden-sharing justice in its effects without any kind of modification. I shall therefore explore such schemes in the following two sections, each of which focuses upon features unique to one kind of carbon pricing mechanism (a downstream rationing scheme) but which might be approximated by the other (a carbon tax), in fulfillment of the promise noted by the paper's title.

IV. DOWNSTREAM RATIONING AND EQUITY IN CARBON ACCESS

A key mechanism for ensuring equitable carbon access is the downstream rationing of carbon emissions entitlements, or the assignment to each of an equitable personal emissions quota (which, unlike the emission right that Hayward criticizes, involves a ceiling rather than a floor on carbon access and is not entrenched as a right but allocated as an entitlement). While firms and other sub-national entities might also be assigned emissions quotas in implementation of national targets through domestic mitigation policies—such upstream rationing schemes are more common policy mechanisms given their relative ease of implementation—my focus shall be upon proposals to ration carbon access or emission rights among persons, which is done at the point of consumption. Since these model resource-sharing equity ideals rather than focusing on the allocation of costs, they can illustrate how equity in carbon access contrasts with burden-sharing equity and yield valuable insights for the design of any equitable carbon pricing scheme.

Variouly termed tradeable energy quotas (TEQs), personal carbon allowances (PCAs), or domestic tradeable quotas (DTQs), such downstream rationing systems (hereafter referred to as *personal carbon trading* schemes, or PCT) impose a fixed emissions allowance on persons but allow for limited trading or other kinds of offsets to achieve part or all of their mandatory limits on personal polluting activity. To further focus on the power of personal carbon budgeting in comparison with market-based mechanisms that use pollution taxes as the primary tool to ration carbon, I compare PCT schemes, though which persons hold carbon permits as a tradable commodity, with carbon taxes, through which carbon is taxed without allowing it to be traded.

While a well-designed carbon tax can be an effective instrument for reducing emissions and financing further decarbonization efforts, and is relatively easy to implement and administer, a downstream rationing scheme like PCT offers some significant advantages in terms of its ability to model resource-sharing equity and foster mitigation responsibility. Unlike a carbon tax, which offers no

assurance that emissions will be reduced by the desired amount, a hard cap can be placed upon allowable emissions through either upstream or downstream rationing schemes. With either kind of rationing scheme, carbon prices fluctuate around a fixed emissions trajectory rather than the other way around, offering more precise controls over emissions. With upstream rationing, fixed and declining emissions caps at points of production can limit and reduce production emissions over time while downstream rationing can do the same for consumption emissions, providing mitigation assurances that a carbon tax cannot.

In a carbon tax, increasing the price of carbon causes greater adverse welfare impacts on the poor, given its regressivity, whether directly from higher energy and transport costs or indirectly from the diminished carbon access that results from seeking to avoid those direct costs. As Jonathan Aldred observes, the commodification of carbon “extends the domain of distribution of goods based on willingness to pay (and ability to pay) in the market” such that the “extreme inequality of access” that now characterizes many market-distributed goods would be “spread to more goods.”¹⁵ Those now forced by economic disadvantage to reside in substandard housing or unsafe communities would under any scheme by which carbon access is allocated by ability-to-pay rather than through some kind of free allowance see yet another good that had previously been freely available to all be transferred into a sphere of market distribution where inequalities in a dominant good beget inequalities in other social goods. Both upstream rationing schemes and carbon taxes are characterized by this regressivity, since they in effect allocate carbon access by ability-to-pay against a background of wide inequality in such ability, while downstream rationing (which does not charge for personal allowances) is not. As previously noted, several popular proposals for “feebate” schemes designed to neutralize the regressive impacts of an upstream ETS or tax recognize and seek to avoid such impacts, and in doing so adopt several key structural elements of PCT schemes, albeit often without recognizing that they are doing so.

With trading included in a rationing scheme, as it is with PCT, both it and a tax achieve efficient abatement through a pricing system that incentivizes decarbonization by making carbon-embedded goods and services more expensive. In order to appreciate the differential impacts of a rationing scheme compared to a carbon tax, and in so doing to better model equity advantages of a PCT scheme into a carbon tax, we might consider how carbon pricing is used to achieve a given social emissions budget in either case. Both operate notionally like a reverse auction, where all start with unlimited access to unpriced carbon emissions but with an auctioneer gradually raising the per-unit price until enough of the auction’s participants forfeit their carbon access (i.e. prefer to keep the fee over its corresponding emission allowance), at which point the carbon price is set for all. Determining sufficient inducement for forfeiture is

¹⁵ Aldred, Jonathan (2012). “The ethics of emissions trading.” *New Political Economy* 17(3):339–360, p. 345.

the auction's objective, with the carbon price increasing until the carbon abatement target is reached.

In such a reverse auction, what could lead to forfeiture prior to reaching the equilibrium price? If attendees had differential access to renewable energy, which functions as a substitute for carbon emissions in that it can generate an equivalent good, some might forfeit their carbon access at \$40 (at which point they could merely switch to a carbon-free alternative without any utility loss) while others would hold onto their carbon access until it hit \$45. Differential carbon access that is based on differential access to substitutes for carbon-based energy would not be unjust, since carbon is only instrumental to the energy access that is the proper focus of justice.

Perhaps the order in which auction participants forfeit their carbon access would also be a function of differential exchange rates between carbon access and utility, such that those forfeiting their access at lower prices were simply less efficient at converting it into welfare and consequently valued it relatively less. In this case, carbon access inequities would promote efficient welfare maximization but could lead to distributive injustice. From a capabilities approach to justice (or "equality of opportunity for welfare"¹⁶), some kind of post hoc adjustment would need to be made to ensure that carbon access remained equitable at that target price, but such considerations affect both rationing and tax-based pricing schemes in similar ways.

However, those forfeiting carbon access at lower prices out of economic necessity raise concerns for any viable theory of justice. Those, for example, unable to afford home heating during winter months or basic transport to work or school at a carbon price above \$25 should not be forced to choose between competing basic necessities but would be forced to so if the carbon price rose to that level. Here the inequity would not be rectified merely by returning to someone that had forfeited their carbon access at \$25 what they had paid for their access up to that point. Such offsets may make the carbon price cost-neutral for them but would reduce their carbon access along with the welfare opportunities that came with it. Full appreciation of the equity impacts of carbon pricing requires a grasp of impacts on carbon access for the disadvantaged, and with it the impacts on social and economic opportunity that carbon access allows—an impact that is captured by resource-sharing but not burden-sharing justice principles.

It is with this post-auction carbon price that we can illustrate several key differences between a downstream rationing scheme and a tax. With taxes, all begin with no default carbon access, so adjustments from their pre-pricing baseline include some combination of increased prices for the carbon that is embedded in the energy as well as other goods and services that they consume and

¹⁶ Arneson, Richard J. (1989), "Equality and equal opportunity for welfare," *Philosophical Studies* 56, 77-93.

some reduction in that consumption. In other words, prior to any offsets or other adjustments, the tax requires them to pay more for carbon abatement, reduce their carbon access, or some combination of the two (a function of the elasticity of their demand for it). Across-the-board cost increases would be regressive, imposing the greatest burdens on the poor. Insofar as those with the least ability-to-pay were also among the first to forfeit their carbon access with rising carbon prices, carbon pricing would be doubly regressive, further restricting carbon access for the poor, as allocating carbon access in terms of willingness-to-pay is ultimately affected by highly unequal ability-to-pay. Feebate schemes that return a share of the tax's proceeds to the poor might be cost-neutral but would still likely result in inequitable carbon access as the marginal utility of an additional ton of carbon access would for the poor need to be weighed against the value of necessities like food and shelter rather than luxuries like vacation homes and holiday travel. Feebate schemes, that is, can appear neutral from a burden-sharing perspective in that the poor may not need to pay more to implement a carbon tax, but equity effects of such a tax do appear from a resource-sharing perspective.

Downstream rationing schemes like a PCT start with a default allocation of carbon access that is typically made on an equal per capita basis—perhaps modified to account for differential abilities to convert such access into welfare—with limited trading at a per-unit rate equivalent to a carbon tax that achieved the same mitigation objective.¹⁷ All would have an identical incentive to reduce or avoid increasing their personal emissions in both cases, since an additional unit of permitted emissions would cost the same and an additional reduction would yield the same return, albeit through an avoided cost under a tax and through proceeds from a trade under a PCT. From Coasian assumptions we might expect that carbon access would be allocated in an identical fashion under either scheme, even if under more realistic constraints the poor would enjoy less carbon access if they had to pay for it than if it was granted as an entitlement. Limits on how much of their personal allocations the poor could sell under a PCT scheme would make it superior from a resource-sharing equity perspective, but it is another difference between the two that may be more normatively significant.

The primary differences between the various “tax with feebate” (TWF) schemes that aim to offset the regressive impacts of carbon taxes and a PCT that requires no such adjustment lie in the flow of finance in each and the meaning or rationale behind it. Starting from what could be stipulated as equitable personal carbon access, for which users are granted allowances under a PCT and could be rebated their carbon tax under a TWF, the two schemes appear similar for all emitting at this equitable level. Those emitting below the equitable threshold would see returns under both schemes: as sellers of unused allowances under

¹⁷ Hyams, Keith (2009). “A just response to climate change: Personal carbon allowances and the normal-functioning approach.” *Journal of Social Philosophy* 40(2): 237-56.

a PCT and with a rebate in excess of carbon taxes paid under a TWF. Similarly, those emitting above the threshold would pay for their excess carbon usage, whether through the required purchase of additional allowances under a PCT or additional taxes beyond what is rebated under a TWF. But payments for those making or receiving them would have different meanings, even if the amounts were the same. Funds would notionally be redistributive in a PCT, as those with relatively high carbon access pay those with relatively low access, reflecting a kind of compensatory justice through which the transfer restores a balance between high and low users that had been disturbed by carbon access inequity. TWF, by contrast, involves no direct transfer between those using more to those using less. In setting an equitable threshold for personal carbon access, a PCT also expresses a norm about equitable levels of such access, reinforcing this norm by rewarding those whose usage remains within the threshold and punishing those whose usage exceeds it, implicitly commending the conservation behaviors that reduce carbon usage and expressing disapprobation about waste. By contrast, a TWF treats each marginal increase in carbon access above zero identically, whether above or below the threshold, communicating nothing about equitable norms, and may also be viewed as excusing all pollution insofar as excessive users pay their due in pollution taxes.

It is here, then, that the value of modelling the equity features of a PCT scheme into a carbon tax becomes apparent. Because it is around equitable carbon access, a PCT is equitable from the start and so requires no redistributive bolt-on like a feebate to ameliorate its regressive effects, as with the tax. Pollution taxes are inherently regressive but can be modified to neutralize their regressivity by mimicking the structure of PCT schemes. If justice is thought to require that all be granted free access to some equitable level of emissions but then be charged for luxury emissions above this threshold, a modified TWF in the amount of those basic emissions would yield the same effect. If instead justice was thought to require entitlements to carbon access above this basic threshold (set, say, at some sustainable level of carbon access but allowing some luxury emissions), this could also be modelled into the feebate. If some persons required more carbon access to realize a given level of welfare and such compensation for lower conversion ability was thought to be a requirement of justice, this could also be readily modelled into the “feebate,” mimicking the effects of varying carbon access allocations. In terms of their operational effects, the two schemes could be designed to be functionally identical.

Apart the PCT’s ability to express and reinforce a norm about equitable carbon access along with the normative significance of providing everyone with sufficient quantities of some good they need to live a minimally-decent life (even where they lack sufficient access to other such goods), having the default include provision rather than sufficient funds for purchase would likely result in less inequality of carbon access overall, since defaults are among “nudges” that influence behavior, here working to maintain greater equality of access

by nudging toward the default.¹⁸ Carbon taxes and other pricing mechanisms have no such equitable defaults, starting as they do with no carbon allowances and charging for incremental usage. Entitlement to sufficient provision of a basic good like carbon as a default is therefore significant for its likely impacts as well as its expressive value on behalf of equity norms.

One could approximate the normative value and practical effect of granting all a basic entitlement to carbon access through a TWF scheme by exempting a basic threshold of carbon usage from a carbon tax rather than reimbursing its value through a feebate scheme. Having the tax kick in when users exceed the basic threshold the system effectively grants the same basic entitlement to carbon access associated with subsistence while requiring persons to pay for further access beyond that level. In order to take advantage of the incentive effects of carbon pricing, however, this exemption would likely need to be set at a very low level, since there would be no incentive to reduce emissions beyond that threshold. Since the carbon entitlement in PCT schemes is typically set above the subsistence threshold in order to allow for the incentive effects of trading, the final advantage of a PCT is that it would return to those with relatively low carbon footprints the proceeds from the sale of additional access to those using beyond their allowances, which could rectify existing inequalities while also providing an incentive for all to decarbonize, whereas a progressive TWF cannot tie the rebate directly to carbon usage without undermining its incentive effects. Suitably modified to mimic key features of a PCT scheme, however, carbon taxes can accomplish many of the same equity objectives if creatively designed.

V. CARBON VISIBILITY, RESPONSIBILITY, AND COOPERATION

Another difference between these two kinds of policy instruments is worth noting for an advantage that is claimed by advocates for PCT and worth trying to approximate (if possible) in the design of a carbon tax. Whereas a carbon tax and rationing schemes that price carbon for upstream polluters like industry and electrical utilities obscure the carbon content of their goods and services by merely passing it along in the price of materials or commodities, downstream rationing schemes that allot carbon access to individual consumers render the carbon content of such goods and services transparent. Such transparency facilitates personal carbon budgeting, which is made necessary by the rationing scheme, but may also confer several other significant benefits. Carbon transparency would allow consumers to compare rival goods in terms of their carbon content as well as their prices, creating decarbonization incentives for

¹⁸ Thaler, Richard H. and Cass R. Sunstein (2008). *Nudge: Improving decisions about health, wealth, and happiness*. New Haven: Yale University Press.

producers though the disclosure and transparency system that PCT requires¹⁹ as well as fostering a higher level of consciousness about carbon footprints amongst consumers that would have to budget for them. While price signals that include carbon pricing may effectively deter carbon-intensive production and consumption they cannot provide direct feedback on the carbon content of goods and services, given the various other factors that can lead to fluctuations in prices.

Since PCT schemes require persons to monitor the carbon that is embedded in the goods and services that they consume and to purchase additional shares upon exceeding their monthly quotas, they require not only that such data be collected (through product or service life cycle analyses) but also that it be transparent to the consumer. The sustainability benefits of product life cycle analyses for producers of such goods have been well documented and are widely discussed elsewhere, but since these analyses are typically conveyed to consumers through carbon labels (with a few exceptions) their impact on consumer behavior and social psychology are less well understood. Their potential is nonetheless tantalizing. Having access to such information might not only empower persons to identify and undertake effective decarbonization actions by giving them access to the information necessary for making meaningful comparisons, but it may also foster a sense of solidarity in cooperative mitigation efforts and help to instantiate norms of responsible consumption and even equity in carbon access.

As David Fleming argues in defense of his proposed tradeable emissions quota scheme, which caps individual emissions from electricity and transport, a PCT system could foster a sense of common purpose from which a more cooperative ethos in pursuing social sustainability goals may emerge, rather than individualizing and depoliticizing decarbonization efforts.

First, the fixed quantity makes it obvious that high consumption by one person leaves less for everyone else. Your carbon consumption – that is, the extent to which you depend on fossil fuels – becomes my business: I have an incentive to influence your behaviour to our mutual advantage: lower demand means lower prices... Secondly, the big structural changes – including a substantial localization of the energy system – that will be needed to achieve deep reductions in dependency on fossil fuels will not by any means be simply a function of individual effort. This is not a negative programme in which individuals are persuaded to reduce energy use (by the use of sanctions such as taxes), but a positive and collective – even exhilarating – incentive to restructure and rebuild the political economy on different principles.²⁰

¹⁹ On the efficacy of disclosure and transparency in this regard, see Fung, A., M. Graham & D. Weil (2007). *Full disclosure: The perils and promise of transparency*. Cambridge: Cambridge University Press.

²⁰ Fleming, David (2007). *Energy and the common purpose: Descending the energy staircase with tradable energy quotas (TEQs)*, p. 14. Available at: <http://www.teqs.net/book/teqs.pdf>

According to Fleming, such effects arise from the transparency of carbon to consumers along with the assignment to each of a share in collective mitigation efforts. A carbon tax that merely feeds product carbon footprint data into a higher price for the commodity would neither empower the consumer with information nor assign to the citizen this responsibility.

Under the scheme that Fleming proposes, persons would be required to purchase additional emissions permits if their carbon footprints from electricity and transport exceeded their quotas, with those permits traded on a market with prices that fluctuate with supply and demand. When many within society fail to comply with their quotas through decarbonization actions and so require carbon offsets to meet them, the market price of additional carbon access would increase, signaling this failure and requiring all to pay a cost of collective as well as personal profligacy. On the other hand, collective success in carbon abatement would yield an additional reward (for buyers, at least) in the form of lower carbon prices, linking individual with social success in a way that could both enhance social solidarity and harness it for the purposes of environmental protection. Because of the potential for significantly reducing social demand for carbon (with its benefits to each in the form of lower offset prices) Fleming suggests that persons would take a fiduciary interest in developing green energy and transport infrastructure, which would counteract the current economic interest in supporting low-cost but high-carbon energy sources based in fossil fuels. Neither of these advantages would accrue in a domestic compliance system built around a carbon tax, where the carbon price would not fluctuate on this basis and so could not yield the same kinds of signals or generate the same incentives.

Similarly, Keith Hyams notes that the economic motive for trading under a PCT scheme “would be supplemented by the additional moral motivation accompanying the belief that one is contributing one’s fair share to the burden of discharging a collective responsibility.”²¹ Critical to this conception of equitable shares is the personal allowance that serves not only as a floor to ensure that all have sufficient carbon access but also as a ceiling for personal carbon footprints without the augmentation of additional offsets and its communication of a crucial social norm about what constitutes a fair share and when one has reached this threshold. While the trading or offset part of the scheme doesn’t impose a hard cap on personal carbon emissions, it could help to create and instantiate a norm about equity in carbon access in the imposition of a universal entitlement with its financial penalty for exceeding this budget. Incorporating peer comparisons that focus on relative use rates among persons within a community could potentially add to this ability of PCT schemes to inculcate a shared sense of responsibility.

²¹ Hyams (2009), p. 238.

Parag and Strickland note that PCT schemes require that persons be informed about their carbon footprints as well as those associated with various activities in which they might engage, which would help to “create a perceptual and cognitive framework enabling individuals to integrate understanding across emissions from different activities, and in the context of energy use as it occurs.”²² They argue that “carbon visibility, awareness, and correct information are crucial for promoting behavioral change” on an individual level, but that transformation in norms regarding greenhouse pollution that results from personal trading programs can also enhance the legitimacy of such remedial efforts, which “increases when people are aware of the problems resulting from their energy use, feel responsible for it, and feel morally obliged to do their bit to help solve these problems.” Even where persons maintain a skepticism about claimed causal links between carbon emissions and the impacts of climate change, this kind of transparency would at least link their individual actions with the carbon footprints of their communities, and with this a more meaningful or integral individual role in pursuing collective objectives.

Most of these claimed benefits of a PCT scheme arise through some combination of the transparency to end users or consumers of carbon-embedded goods and services along with the imposition of a cap on (or entitlement to) personal carbon access. Carbon taxation schemes do neither of these things, but there may be several mechanisms that could be incorporated into such schemes to approximate some of the effects noted above. In order to capture some of the value of carbon transparency, the carbon tax collected upstream in the production process but passed along to the consumer in the price of carbon-embedded goods and services could be noted on the bill or receipt, along with an approximation of its carbon content on the basis of that charge. A supplementary database (perhaps accessible through a product’s UPC code) could allow the consumer to compare the carbon content of alternatives based on this pass-through tax, much as product carbon footprint labels aim to allow for such comparisons.

Banks or credit card issuers could track personal spending on carbon taxes and report this to consumers, perhaps including similar peer comparison nudges to indicate whether this amount was higher or lower than others in the community and is so doing potentially contributing toward equity norms of the kind noted above. In order to connect personal with social success or failure in abatement efforts, carbon tax rates could be adjusted more frequently than typical, and perhaps accompanied by the announcement that this adjustment reflects how well or poorly society at large is performing rather than reflecting only modelling error by the economists that set the rate.

²² Parag, Yael and Deborah Strickland (2010). “Personal carbon trading: A radical policy option for reducing emissions from the domestic sector.” *Environment: Science and Policy for Sustainable Development* 53(1): 29-37, p. 32.

Finally, the marginal tax rate for carbon usage could increase with increasing use (similar to graduated rates used by water or other utilities to deter waste and encourage conservation), sending an additional signal to those with the biggest carbon footprints and perhaps conveying some social disapprobation in the process. While it could not convey the zero-sum logic of a rationing system, where profligacy by some entails deprivations for others (so any such system would need to remain attention to wide inequities in carbon access, as noted above), the creative communication of excess in graduated carbon tax rates might communicate something similar. In linking individual costs with collective political and infrastructural decarbonization efforts, a well-designed carbon tax can help to harmonize self and public interest, aligning incentives for individual and public good where such incentives may otherwise be opposed.

Inasmuch as high earners now consider progressive tax rates as a punishment for or disincentive to earning more (not that this dissuades them from seeking ever-increasing salaries and bonuses) they might regard a progressive tax on carbon similarly. In this sense, a tax could help to develop or reinforce low-carbon consumption norms. Insofar as they do not, they would at least be providing society with revenues that could be used to invest in green infrastructure and energy, with increasing luxury carbon taxes devoted to funding such projects and to assisting those adversely impacted by this sustainable transition (so that can be a “just transition”) rather than being returned to the treasury and used to finance tax cuts or unrelated spending. As with the issues of equity in carbon access noted above, a well-designed carbon tax could assist in developing an ethos of equity and cooperation while also creating incentives to promote greater equity in carbon access and generating the revenue needed to make this no longer necessary.

VI. CONCLUSION

Attending to both the resource-sharing dimension of equity in carbon access and burden-sharing dimension of climate mitigation policies reveals how carbon pricing schemes may still create inequities in access while neutralizing cost impacts through “feebate” provisions to carbon taxes. Addressing both kinds of inequity in development and implementation of pricing schemes is nonetheless important, despite the relative lack of attention to impacts on carbon access of such proposals. By comparing these two policy mechanisms and by seeking to retain the best features of each in a carbon tax that mimics a downstream rationing scheme the development of new and more encompassing and normatively comprehensive “tax with feebate” schemes can more closely realize at this second stage the climate justice principles that have been identified as properly guiding the development of first stage climate policy architecture. In so doing it can also contribute to normative theorizing of this otherwise-neglected but crucial policy stage.

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